Preliminary Draft of SCAQMD 2016 AQMP Stationary Source Measures
April 2016

The Clean Air Act requires an emission reduction strategy for areas in non-attainment with the federal air quality standards. The following is a list of the preliminary draft 2016 AQMP stationary source measures proposed as part of an overall strategy to reduce emissions to meet the ozone and PM2.5 standards. The overall strategy will also include local mobile source measures implemented by the SCAQMD, state mobile source measures implemented by the California Air Resources Board (CARB) as well as federal and international source measures.

TITLE	EMISSION REDUCTIONS (tpd) (2023/2031)
SCAQMD Stationary Source NOx Measures:	
ECC-01: Co-Benefit Emission Reductions from GHG Programs, Policies, and Incentives [All Pollutants]	TBD
ECC-02: Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [All Pollutants]	0.3 / 1.1
ECC-03: Additional Enhancement in Building Energy Efficiency and Smart Grid Technology [All Pollutants]	3.1 / 4.8
ECC-04: Reduced Ozone Formation and Emission Reductions from Cool Roof Technology [All Pollutants]	TBD
CMB-01: Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NOx, VOC]	5.5 / 10.9
CMB-02: Emission Reductions from Commercial and Multi-Unit Residential Space and Water Heating [NOx]	1.6 / 2.9
CMB-03: Emission Reductions from Non-Refinery Flares [NOx]	1.4 / 1.5
CMB-04: Emission Reductions from Restaurant Burners and Residential Cooking [NOx]	1.6 / 1.6
CMB-05: Further NOx Reductions from RECLAIM Assessment [NOx]	0 / 5
FLX-01: Improved Education and Public Outreach [All Pollutants]	n/a
MCS-01: Improved Breakdown Procedures and Process Re-Design [All Pollutants]	n/a
TOTAL SCAQMD NOx REDUCTIONS (tpd)	**13.5 / 28**
SCAQMD Stationary Source VOC Measures:	
ECC-02: Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [All Pollutants]	0.07/ 0.30
ECC-03: Additional Enhancement in Building Energy Efficiency [All Pollutants]	0.8 / 1.6
CMB-01: Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NOx, VOC]	2 / 4
FUG-01: Improved Leak Detection and Repair [VOC]	2 / 2
CTS-01: Further Emission Reductions from Coatings, Solvents, Adhesives, and Lubricants [VOC]	1 / 2
FLX-02: Stationary Source VOC Incentives [VOC]	TBD
BCM-10: Emission Reductions from Greenwaste Composting [VOC, NH3]	1.5 / 1.8
TOTAL SCAQMD VOC REDUCTIONS (tpd)	**7 / 12**

TITLE	EMISSION REDUCTIONS (tpd) (2021/2025)
SCAQMD Stationary Source PM2.5 Measures:	
BCM-01: Further Emission Reductions from Commercial Cooking [PM]	2.7 / 2.7
BCM-02: Emission Reductions from Cooling Towers [PM]	TBD
BCM-03: Further Emission Reductions from Paved Road Dust Sources [PM]	TBD
BCM-04: Emission Reductions from Manure Management Strategies [NH3]	TBD
BCM-05: Ammonia Emission Reductions from NOx Controls [NH3]	TBD
BCM-06: Emission Reductions from Abrasive Blasting Operations [PM]	TBD
BCM-07: Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM]	TBD
BCM-08: Further Emission Reductions from Agricultural, Prescribed, and Training Burning [PM]	TBD
BCM-09: Further Emission Reductions from Wood Burning Fireplaces and Wood Stoves [PM]	TBD
BCM-10: Emission Reductions from Greenwaste Composting [VOC, NH3]	0.1 / 0.1
TOTAL SCAQMD PM2.5 REDUCTIONS (tpd)	**3 / 3**
All Feasible Measures:	
MCS-02: Application of All Feasible Measures [All Pollutants]	TBD

4/8/16

CO-BENEFIT EMISSION REDUCTIONS FROM GHG PROGRAMS, POLICIES, AND INCENTIVES

[ALL POLLUTANTS]

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

DESCRIPTION OF SOURCE CATEGORY

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

Background

Significant efforts are currently being undertaken and planned to reduce GHGs under the State's 2020, 2030 and 2050 targets. Under the 2006 California Global Warming Solutions Act (AB32) the state established a 2020 GHG target to reduce emissions 20% from 1990 levels. Additionally, in 2006, Governor Arnold Schwarzenegger set a course towards reducing California's GHG emissions 80% below 1990 levels by 2050 through executive order S-3-05. The 2050 target was established based on the emissions limits needed to prevent catastrophic warming and limit earth's warming to below 2 degrees. To help achieve the 2050 target, a midterm 2030 GHG target of 40% below 1990 levels was set by Governor Jerry Brown in 2015.

In 2006, the passage of AB32 also established a Cap & Trade program in California. Under the Cap & Trade program, an emissions limit is placed on the largest stationary sources of GHGs, fuel providers, and imports of electricity. The emissions cap on these sources is lowered over time and entities under the cap may choose to reduce their emissions or purchase allowances from the market to cover their emissions.

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

To help achieve GHG reductions, many different regulations, market mechanisms, and incentive programs are being implemented in California. As these GHG reduction efforts are undertaken across all sectors, the 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 (AB32) to develop regulations and programs that reduce California's GHG emissions 20% below 1990 levels by 2020 along with establishing a Cap & Trade program. Under AB32, 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 AB32 several regulations and programs have been implemented along with executive orders to reduce GHG levels in California 80% by 2050 and a midterm target of 40% by 2030 below 1990 levels. Prior to the adoption of AB32, California established a 20% renewable portfolio standard (RPS) mandate for investor owned utilities in 2002. The RPS mandate was then expanded in 2011 to include municipal owned utilities along with establishing a new mandate of 33% by 2020. Recently, as part of SB 350, the RPS mandate was expanded to be 50% by 2030 along with increasing efficiency of existing buildings (see ECC-02).

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

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

PROPOSED METHOD OF CONTROL

GHG reductions being implemented through federal, state, and local programs are being implemented across multiple energy sectors and are generally mandated by law. The GHG emission reductions are being implemented through several mechanisms

such as market programs, renewable energy targets, incentive and rebate programs, and promoting implementation and development of new technologies.

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

Under this control measure, the criteria pollutant reductions associated with GHG reductions will be quantified and utilized towards attainment of federal ozone and PM2.5 standards. As the GHG programs are implemented, the SCAQMD staff will help provide any additional enhancements needed to achieve further criteria pollutant reductions. Existing and future incentives, programs, and partnerships will be evaluated for reduction of emissions of both GHGs and criteria pollutants. SCAQMD will also work closely with other agencies and stakeholders to focus GHG reduction programs within the South Coast Basin to maximize emission reductions across all pollutants.

EMISSION REDUCTIONS

TBD

RULE COMPLIANCE AND TEST METHODS

Performance of GHG reductions and criteria pollutant reductions will be measured through SCAQMD and state agencies emission inventories along with reductions achieved through specific programs.

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

The District 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

Fifth Assessment Report (AR5) Intergovernmental Panel on Climate Change: https://www.ipcc.ch/report/ar5/.

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

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

EPA Endangerment Findings for Greenhouse Gases: http://www3.epa.gov/climatechange/endangerment/.

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

CO-BENEFITS FROM EXISTING RESIDENTIAL AND COMMERCIAL BUILDING ENERGY EFFICIENCY MEASURES [NOX, VOC]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	EXISTING RESIDENTIAL AND COMMERCIAL POWER AND FUEL USE			
CONTROL METHODS:	REDUCED ENERGY USE			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	21.7	14.2	13.5	11.9
NOX REDUCTION			0.4	1.3
NOX REMAINING			13.1	10.6
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	15.6	10.8	10.3	9.7
NOX REDUCTION			0.3	1.1
NOX REMAINING			10.0	8.6
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	9.1	8.9	8.9	8.9
VOC REDUCTION			0.23	1.0
VOC REMAINING			8.7	7.9
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	2.8	2.64	2.63	2.65
VOC REDUCTION			0.07	0.29
VOC REMAINING			2.56	2.36
CONTROL COST:	TBD			
IMPLEMENTING AGENCY:	SCAQMD			

DESCRIPTION OF SOURCE CATEGORY

Energy consumption in existing residential and commercial buildings results in direct and indirect emissions of criteria, toxic, and greenhouse emissions. Direct emissions result from combustion fuels such as natural gas, propane, and wood. Indirect emissions are a result of energy use associated with electricity production. Improvements in residential weatherization and other efficiency measures provide

emission reductions through reduced energy use for heating, cooling, lighting, cooking, and other needs.

Background

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

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

In California and the Basin there is significant potential to achieve large energy reductions from retrofitting existing buildings. Within the Basin, 64% of the residential structures in Southern California 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, toxic, 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 efficient savings in electricity and natural gas energy uses of retail customers and increase renewable energy sources from 33 to 50 percent by 2030.

Regulatory History

The 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 using control measures. Emission reductions from efficiency efforts beyond the baseline inventory will primarily be gained from new efforts under the requirements of SB350. On October 7, 2015 California Governor Jerry Brown signed the Clean Energy and Pollution Reduction Act of 2015 (SB350).

PROPOSED METHOD OF CONTROL

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

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

EMISSION REDUCTIONS

Weatherization and other efficiency measures are typically permanent measures that provide cumulative benefits. The existing energy efficiency programs are having impacts on emission reductions and are generally taken into account within the baseline emissions inventory. The recent passage of SB350 significantly enhances the state's renewable energy and efficiency targets. Emission benefits expected from the implementation of SB350 are not yet within the 2016 AQMP future year emission inventory. The emission benefits from implementing SB350 through accelerated deployment, additional programs, and tools within the Basin are expected to achieve approximately 2-3 percent reduction by 2023 and 11% reduction in NOx emissions by 2031. The reduction in NOx emissions would be the result of less natural gas usage.

RULE COMPLIANCE AND TEST METHODS

N/A

COST EFFECTIVENESS

Weatherization and efficiency measures when appropriately applied can realize short payback periods from reduced energy costs.

IMPLEMENTING AGENCY

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

REFERENCES

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

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

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

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

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

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

ADDITIONAL ENHANCEMENT IN BUILDING ENERGY EFFICIENCY AND SMART GRID TECHNOLOGY

[NOX, VOC]

CONTROL MEASURE SUMMARY

SOURCE CATEGORY: EXISTING RESIDENTIAL AND COMMERCIAL POWER AND FUEL USE

CONTROL METHODS: REDUCED ENERGY USE BEYOND EXISTING REGULATIONS

EMISSIONS (TONS/DAY):

ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	21.7	14.5	13.8	11.9
NOX REDUCTION			4.1	7.1
NOX REMAINING			9.7	4.8
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	15.6	10.8	10.3	9.7
NOX REDUCTION			3.1	4.8
NOX REMAINING			7.2	4.9
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	9.1	8.9	8.9	8.9
VOC REDUCTION			2.7	5.3
VOC REMAINING			6.2	3.6
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	2.8	2.6	2.6	2.6
VOC REDUCTION			0.8	1.6
VOC REMAINING			1.8	1.0

CONTROL COST: TBD

IMPLEMENTING AGENCY: SCAQMD

DESCRIPTION OF SOURCE CATEGORY

Energy consumption in existing residential and commercial buildings results in direct and indirect emissions of criteria, toxic, and greenhouse emissions. Direct emissions result from combustion fuels such as natural gas, propane, and wood. Indirect emissions are a result of energy use associated with electricity production. Improvements in residential weatherization and other efficiency measures beyond

existing regulations provide additional emission reductions through reduced energy use for heating, cooling, lighting, cooking, and other needs. Co-benefit reductions from current building codes and SB350 (Clean Energy Pollution Reduction Act of 2015) are accounted for in control measure ECC-02 (Co-benefits from Existing Residential and Commercial Building Energy Efficiency Measures). ECC-03 sets a path to double the energy efficient savings in electricity and natural gas energy uses of retail customers and increase renewable energy sources from 30 percent by 2023 to 50 percent by 2031.

Background

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

However, 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. One such opportunity could be increasing energy efficiency within rental and leased properties (48% 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. Within the Basin, 64% of the residential structures in Southern California 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 beyond existing programs provides additional benefits in reduced energy costs, energy infrastructure needs, and emissions of greenhouse, toxic, and criteria pollutants.

A smart grid is an electrical grid which includes a variety of operational and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficiency resources. Electronic power conditioning and control of the production and distribution of electricity are important aspects of the smart grid. The California Independent System Operator (CAISO) is developing a distributed energy resource program (DERP) that allows the aggregation of several smart grid systems to bid into the wholesale electricity power market. Grid based storage systems can replace the need for new peaking generation, be coupled with renewable generation, and reduce need for additional energy infrastructure. Implementing new hardware such as renewable generation and storage along with other energy resources increasingly requires implementation of smarter grid control technologies.

Regulatory History

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

PROPOSED METHOD OF CONTROL

Implementing and achieving reductions beyond SB350 and Title 24 is expected to be administered through state agencies and implemented, in part, through electrical and natural gas utilities. The SCAQMD has worked with the local utilities and implemented weatherization programs within the Coachella Valley, Boyle Heights, and San Bernardino areas. Implementation of weatherization and smart grid programs has helped lower the barrier to implementing weatherization and smart grid efforts within Environmental Justice Communities.

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

EMISSION REDUCTIONS

Weatherization, smart grid and other efficiency measures are typically permanent measures that provide cumulative benefits. The existing energy efficiency programs are having impacts on emission reductions and are generally taken into account within the baseline emissions inventory. Emission benefits expected from actions going beyond SB350 and Title 24 are not yet within the 2016 AQMP future year emission inventory. Accelerated deployment, additional programs, and tools within the Basin could achieve an additional 30% reduction in NOx emissions by 2023 beyond the current existing efficiency programs and 50% reduction by 2031. The reduction in NOx emissions would be the result of less natural gas usage.

RULE COMPLIANCE AND TEST METHODS

N/A

COST EFFECTIVENESS

Weatherization, smart grid and efficiency measures when appropriately applied can realize short payback periods from reduced energy costs.

IMPLEMENTING AGENCY

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

REFERENCES

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

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

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

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

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

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

REDUCED OZONE FORMATION AND EMISSION REDUCTIONS FROM COOL ROOF TECHNOLOGY [ALL POLLUTANTS]

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

DESCRIPTION OF SOURCE CATEGORY

Background

Cool roofs reflect a higher fraction of incident sunlight than traditional roofing materials. Widespread adoption of cool roofs can mitigate the urban heat island effect and lower daytime ambient temperatures, thus slowing the rate of ozone formation. In addition, buildings equipped with cool roofs require less energy for cooling, leading to reduced emissions from the power generation sector. However, installation of some cool roof surfaces can increase the fraction of reflected UV light and potentially increase ozone formation rates. This control measure is designed to leverage the air quality benefits of cool roof technology, while minimizing potential ozone increases when installing cool roof materials. This control measure has the potential to reduce ambient ozone concentrations directly along with NOx, CO, PM, and CO_2 emissions from the power generation sector. Evaporative emissions of VOCs will also be reduced under lower ambient temperatures.

Regulatory History

Title 24, part of California's Energy Efficiency Standards for Residential and Nonresidential Buildings (2013) requires that new or replacement roofs are cool roofs. The standards are based on the minimum 3-year aged solar reflectance, the thermal emittance, and the minimum solar reflectance index for the roofing materials. The specific requirements are dependent on the roof slope (high-slope vs. low slope), the climate zone, and the building use (non-residential, residential, high-rise residential, hotel/motel). The Cool Roof Rating Council has developed methods to measure the radiative properties of roofing products. Test data is readily available for different roofing materials. Several municipalities within the SoCAB such as Glendale, Los Angeles, and Pasadena have ordinances that expand Title 24 requirements.

PROPOSED METHOD OF CONTROL

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

1) Solar Reflectance: In order to qualify as a cool roof, roofing materials must meet certain radiative property requirements. Solar reflectance is an important property that quantifies the fraction of solar energy that is radiated back into space. A roof with a large solar reflectance can keep a building cool. However, ultra-violet solar energy can also be reflected, leading to increased ozone formation in the air column above the building. Therefore, to minimize inadvertent ozone formation, a rooftop with a minimal ultra-violet solar reflectance and a large reflectance of visible and infra-red light is preferable. This control measure would require that ultra-violet solar reflectance is also considered when selecting roofing materials that meet Title 24 cool roof standards.

2) Radiative Properties:Title 24 mandates that new or replacement residential roofs meet prescribed radiative properties in select climate zones within California. Depending on the resulting air quality benefits, the expansion of residential Title 24 requirements to climate zones within the SoCAB that are currently exempt may be an effective method to reduce air pollution. Low-slope high-rise residential and hotel/motel rooftops within the SoCAB in climate zones 6 and 8 are currently unregulated[1]. Low- slope residential rooftops are not regulated in climate zones 6, 8, 9 and 10 while high-slope residential rooftops are not regulated in climate zones 6, 8, and 9.[2]

3) Roof Replacements: Since Title 24 does not cover existing rooftops, full implementation is not expected until it is necessary to replace all existing rooftops. If the technical modelling analysis shows significant improvements in ambient ozone concentrations if all rooftops meet Title 24 standards, subsidies for the

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

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

replacement of roofs not meeting Title 24 standards could be a cost-effective method to accelerate air quality benefits.

EMISSION REDUCTIONS

The meteorological and air quality effects of the proposed methods of control are complicated and non-linear. A technical modelling analysis to quantify the effects of this control measure is currently being conducted. This measure has the potential to reduce ozone directly by slowing the rate of ozone formation in the SoCAB. Reduced energy consumption for building cooling will lead to reductions in NOx, PM2.5, CO, CO_2, and air toxics emissions from the power generation sector. Evaporative VOC emissions will be reduced due to lower ambient temperatures in the urban areas of the Basin.

RULE COMPLIANCE AND TEST METHODS

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

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

2013 Nonresidential Compliance Manual, California Energy Commission.
2013 California Energy Efficiency Standards Nonresidential Compliance Manual

2013 Residential Compliance Manual, California Energy Commission.
2013 California Energy Efficiency Standards Residential Compliance Manual

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

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

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

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

TRANSITION TO ZERO AND NEAR-ZERO EMISSION TECHNOLOGIES FOR STATIONARY SOURCES [NOX, VOC]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	COMBUSTION SOURCES SUCH AS ENGINES, TURBINES, MICROTURBINES, BOILERS, AND FLARES AT COMMERCIAL, INDUSTRIAL, RESIDENTIAL AND TRANSPORTATION SOURCES			
CONTROL METHODS:	ZERO AND NEAR-ZERO EMISSION TECHNOLOGIES AND FINANCIAL INCENTIVE PROGRAMS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	16.6	14.6	14.4	14.3
NOX REDUCTION			4.3	8.6
NOX REMAINING			10.1	5.7
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	22.3	18.6	18.2	18.2
NOX REDUCTION			5.5	10.9
NOX REMAINING			12.7	7.3
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	7.0	6.8	6.8	6.7
VOC REDUCTION			2.0	4.0
VOC REMAINING			4.8	2.7
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	7.0	6.8	6.8	6.7
VOC REDUCTION			2.0	4.0
VOC REMAINING			4.8	2.7
CONTROL COST:	TO BE DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD			

DESCRIPTION OF SOURCE CATEGORY

This proposed control measure would seek emission reductions of NOx from traditional combustion sources by replacement with zero and near-zero emission technologies including equipment electrification or fuel cells for combined heating

and power (CHP). In addition, many existing homes and businesses will, in the future, update and modernize their facilities using cleaner, lower emission, less toxic alternative processes and materials, and increasing efficiency. However, since many of these cleaner options may not be the lowest-cost option, their use may need to be incentivized with lower polluting and less toxic alternative processes and materials for existing residential, commercial, and industrial modernization and encourage new construction by the same means. Using an incentives-based approach will encourage businesses to make choices that will reduce emissions while minimizing cost impacts. An incentive-based approach is also consistent with business retention efforts, particularly in regards to replacing older higher-emitting equipment with zero and near-zero emission equipment.

In the industrial and commercial sectors, natural gas-fired engines, turbines, microturbines, and boilers are widely utilized for the production of facility power, heating, and steam production. Further, oil and gas production facilities that flare process gas may be able to utilize fuel cells as a lower emissions alternative to flare combustion while simultaneously producing electricity for their operations. Fuel cells are ultra-low emitting technology and have been installed at numerous locations across the nation. Fuel cells would provide more efficient operation with concurrent reductions of NOx.

Implementing larger amounts of intermittent renewable generation along with providing power to increasingly larger amount of electrified equipment and transportation sources may result in increased power generation emissions. Incorporating newer technologies such as energy storage along with better power system management at the transmission, distribution, and behind the meter applications can reduce the need for redundant infrastructure, provide for greater grid reliability, and reduce the need for new fossil-based generation which would reduce emissions.

Background

Zero and Near-Zero Emission Technologies

Replacing older higher-emitting equipment with newer lower or zero-emitting equipment can apply to a single source or an entire facility for existing sources. New businesses can be required to install and operate zero-emission equipment, technology and processes beyond the current BACT requirements. Electrification of equipment powered by electrical energy is one way to shift away from combustion sources generating NOx emissions. The combustion equipment includes engines, turbines, boilers, microturbines, etc. located at industrial and commercial facilities and sites. The modification of residential and commercial water and space heating equipment is addressed under Control Measure CMB-02 (Emission Reduction from Commercial and Multi-Unit Residential Space and Water Heating).

Fuel cells are also capable of producing power with very low pollutant emissions (single digit NOx ppm levels). In fact, fuel cells can produce electricity much more efficiently (between 45-50% efficiency) than combustion-based engines and turbines (between 25-35% efficiency). This technology uses hydrocarbon fuel and air to produce electricity and heat via an electrochemical reaction. There are many installations of fuel cells across many source categories as an alternative to traditional combustion methods, resulting in a reduction of NOx emissions with co-benefit of reducing other criteria air pollutants and GHG.

In the South Coast Air Basin, fuel cells would be most suitable for replacing combustion units that primarily generate electricity. These include internal combustion engines (ICEs), microturbines, and gas turbines that are fueled by natural gas. Fuel cells are particularly sensitive to impurities and natural gas does not have to undergo extensive cleanup, as do other fuel streams. However, other fuel streams such as wastewater treatment plant digester gas, landfill gas, and process gas from oil and gas production operations can be processed and cleaned up for use in transportation fuels, providing economic and air quality benefits.

Combustion units such as boilers would also be suitable for this application because fuel cells are capable of producing high pressure steam that can serve the demands of the facility in addition to producing electricity that can be used by the facility.

Integrating a fuel cell with an absorption chiller would result in a clean source of electrical power while at the same time utilizing the exhaust heat for both heating water and converting a portion of the heat into cooling for air conditioning. Reducing usage of electricity based chillers for space cooling will contribute to emission reductions from power plants. This type of project is currently in operation and demonstration at the University of California, Irvine Medical Center in Orange, CA.

A tri-generation (heat, power, and hydrogen) demonstration project at Orange County Sanitation District has demonstrated that the gas cleanup system is capable of removing contaminants such as siloxanes, sulfur, and hydrocarbons.

Energy Sector

The electrical utility grid maintains stability by matching generation with demand. Maintaining grid stability is becoming difficult with increasingly higher percentages of power generation coming from intermittent renewable generation sources along with increasingly higher electrical load demands from electric transportation. These new variables on the grid require dispatchable and flexible resources that add load and provide power when needed. Peaking generation units typically have provided these resources but have low utilization factors, are less efficient than base load plants, can be difficult to site, and are emission sources. The use of energy storage provides a flexible and dispatchable resource with zero emissions. Grid based storage systems can replace the need for new peaking generation, be coupled with renewable generation, and reduce need for additional energy infrastructure. Although the applications for using energy storage are vast, some of the most

valuable uses include reducing demand charges, providing backup power, reducing infrastructure needs to incorporate electric transportation, demand response capabilities, and short term dispatchability. Additionally, implementing new hardware such as renewable generation and storage along with other energy resources increasingly requires implementation of smarter grid control technologies.

Under SB350, California has increased the renewable portfolio standard from 33% by 2020 to 50% by 2030. Due to the large amounts of solar generation already providing power on the electrical grid, there are periods of over generation that later lead to high power ramp rates for fossil powered generation sources. Rather than curtail renewable power the use of storage provides a flexible and dispatchable resource as one of many different applications. California adopted AB2514 to start the integration and development of at least 1.3 GW of energy storage within the State's investor owned utilities.

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

Facility Modernization

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

Regulatory History

Incentives

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

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

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

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

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

Energy Sector

SB350 - Clean Energy and Pollution Reduction Act of 2015

AB2514 - Energy Storage Systems

SB-17 Smart Grid Control Deployment Plan

PROPOSED METHOD OF CONTROL

Zero and Near-Zero Emission Technologies

The method of control would target non-power plant combustion sources such as engines, turbines, and boilers that generate power for electricity for distributed generation, facility power, process heating, and/or steam production, and replacement with zero or near-zero emission technologies for these stationary sources. Specific sources include industrial and commercial facilities operating natural gas, diesel and liquid petroleum gas (LPG) stationary and emergency engines, as well as NOx point sources from the service/commercial and manufacturing/industrial sectors. Additionally, oil and gas production facilities that flare process gas would be targeted for replacement with fuel cell technology. The combustion units currently installed have been in operation for many years and most have already undergone post-combustion retrofits in order to meet current emission standards. An implementation schedule that would be based on equipment age could be adopted to ensure that the existing units serve their useful equipment life or provide incentives to allow early retirement and advanced replacement with zero or near-zero emission technologies.

Co-Benefits from Energy Storage and Smart Grid

Zero emission technologies and applications are becoming more prevalent to be considered as Best Available Control Technologies (BACT) and/or replace existing combustion technologies. Conversion for some sources such as hospitals, hazardous operations and transportation sources that rely on constant power to avoid potential life-threatening consequences would need to be ensured an available supply of electricity in case the primary source of power is compromised. Thus, energy storage and smart grid would prove beneficial, if not necessary. For others, high value grid and rate reduction applications are being developed and demonstrated to provide emission reductions. The SCAQMD will work with agencies, utilities, businesses and other stakeholders to implement smart grid systems, energy storage, and integration of electric transportation.

Incentivizing Facility Modernization

Incentivizing emissions reductions from various stationary and area sources through incentive programs for the use of zero and near-zero emission technologies is an effective approach in achieving immediate NOx reduction in both the short and long-term. Facilities would be able to qualify for incentive funding if they utilize equipment or accept permit conditions which result in cost-effective emissions reductions that are beyond existing requirements. The program would establish procedures for quantifying emissions benefits from clean technology implementation and develop cost-effectiveness thresholds for funding eligibility.

SCAQMD's new tool for the annual emission reporting (AER) program requires reporting emissions at permit unit / equipment / device levels. The reporting tool classifies the type of emission source (e.g., external combustion, internal combustion, coatings, tanks, etc.) and requires fuel type, throughput, pollutant and emission factors. Thus, the tool could assist in identifying high emitting equipment that would be a priority to incentivize for cleaner processes and technologies.

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

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

1. Provide incentives to replace older higher-emitting equipment with newer lower emitting equipment for area and stationary sources, which can apply to a single source or resident, or an entire facility.

2. Provide incentives for existing residences and businesses to implement zero and near-zero emission technologies throughout their operations.

3. Encourage new businesses that use and/or manufacture near-zero and zero emission technologies to site in the Basin.

Through the years, a variety of incentives have been implemented, such as exempting electric equipment from permitting, implementing measures to streamline permit processing for cleaner equipment, use of short-term mobile source credits, mitigation fee programs, the Air Quality Investment Program (AQIP), and emissions averaging provisions in rules. The incentive programs, which include incremental funding or subsidies, are designed to promote voluntary introduction of new technologies on an accelerated schedule. These programs may also provide manufacturers with incentives to accelerate the deployment of cleaner technologies.

For stationary sources, the SCAQMD staff has compiled a list of potential incentives to encourage businesses to use zero- or near zero emission technologies or enhancements to the SCAQMD's existing programs to reduce or eliminate barriers to implement state of the art technologies. The list below represents an "initial list" of potential concepts. It is expected that as the SCAQMD staff and stakeholders further explore incentives, additional concepts may be identified while others may be removed. By providing this initial list of incentives, the SCAQMD staff is not endorsing any specific incentive. However, the SCAQMD staff is committed to further investigating the concepts.

- **Incentive Funding:** The concept of incentive funding involves the creation of economic incentives to reduce the cost and encourage businesses to replace their existing high emitting equipment with equipment that is zero- or near-zero emitting. It includes mechanisms such as loans and grants. Funding for these programs could derive from mitigation fees, penalty or settlement fees, or federal or state grants and programs.
- **Permitting and Fee Incentives and Enhancements:** Permitting and fee incentives and enhancements would include the expansion of the existing equipment certification program and pre-approved permit program to include additional equipment categories. Incentives involving reduced permitting fee programs for advanced technologies which significantly reduce emissions as well as other permitting enhancements identified as part of the 2012/2013 priority projects are also discussed in this incentive approach.
- **NSR Incentives and Enhancements:** The mechanism of credit offsets and NSR incentives includes expanding the number of exemptions under Rule 1304 - Exemptions and expanding the use of the priority reserve under Rule 1309.1 –

Priority Reserve. In addition this mechanism includes the adoption of a Clean Air Investment Fund and the short-term leasing of offset credits.

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

EMISSION REDUCTIONS

When providing incentives, the modernization of facilities could take place in the both the short- and long-term. The availability and amount of incentives would directly affect the level of emission reductions achieved. For 2023, it is necessary to convert combustion sources into zero and near-zero emission technologies as quickly as possible. The more incentives provided, the more immediate result in NOx emission reductions. An estimated 30 percent reduction could be achieved by 2023 from converting existing stationary combustion sources to zero and near-zero emission technologies. Since facilities and equipment will get older and become less efficient over time, there is greater opportunity to achieve more emission reductions. Thus, an effort to modernize with a combination of regulatory and incentive-based approach could result in a 60 percent emission reduction by 2031. Emission benefits from incentives can be quantified based on program participation, technology penetration, and other assessment and inventory methods. Implementing additional incentive programs will provide a means to quantify these benefits as they are developed. Updated emission reductions achieved from these activities will be incorporated into the subsequent SIP revisions as projects are implemented.

RULE COMPLIANCE AND TEST METHODS

Local

SCAQMD Method 100.1.

Energy Sector

Mandates for increasing the renewable power generation, storage capacities, and smart grid implementation are being implemented through the California Energy Commission (CEC), California Public Utilities Commission (CPUC), California Air Resources Board (CARB) and California Independent System Operator (CAISO). The SCAQMD will work with these agencies in identifying applications with high value streams that provide emission reductions. As the technologies evolve, there

may be applications that warrant SCAQMD to enact regulations that require their use as BACT.

COST EFFECTIVENESS

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

The SCAQMD has implemented several funding programs to help facilitate specific technologies and compliance with SCAQMD rules. One such effort involved the establishment of the Rule 1470 Risk Reduction Fund in May 2012. This fund was adopted by the SCAQMD Governing Board to set aside $2.5 million to offset the cost of purchasing diesel particulate filters for new diesel emergency standby engines as required under Rule 1470 - Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines. Another program is the Dry Cleaner Financial Incentive Grant Program which was designed to assist local dry cleaners to switch to non-perchloroethylene dry cleaning systems to comply with Rule 1421 - Control of Perchloroethylene Emissions from Dry Cleaning Systems. Up to $20,000 was available for CO_2 machines and $10,000 for water-base system machines. For a limited time, $5,000 was available for hydrocarbon machines. Since 2008, the program has provided approximately $265,000 to local dry cleaners in order to upgrade their systems. In addition, there are several existing incentive programs which help promote higher efficiency and lower emitting technologies such as the: Lawn Mower and Leaf Blower Exchange; SOON Program; Carl Moyer Memorial Air Quality Standards Attainment Program; MSERC Credit Programs; and Voucher Incentive Program. Fuel cell technology may qualify for state funding incentives for self-generation of power using clean energy. These incentives could make the control measure much more financially viable.

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

IMPLEMENTING AGENCY

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

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

REFERENCES

2016 AQMP White Paper – Industrial Facility Modernization (December 2015): http://www.aqmd.gov/docs/default-source/Agendas/aqmp/white-paper-working-groups/wp-indfacmod-final.pdf?sfvrsn=2

Assessment of Available Technology for Control of NOx, CO, and VOC Emissions From Biogas-Fueled Engines, South Coast Air Quality Management District, Planning Rule Development and Area Sources, September 2012

"Energy Department Applauds World's First Fuel Cell and Hydrogen Energy Station in Orange County." *Energy.gov*. U.S. Department of Energy, 16 Aug 2011, Web, 13 Jan 2016

California Energy Action Plan: http://www.energy.ca.gov/energy_action_plan/index.html

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

Energy Storage System Procurement Targets from Publicly Owned Utilities (AB2514): http://www.energy.ca.gov/assessments/ab2514_energy_storage.html

Electricity Smart Grid Systems (SB-17): http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100SB17

EMISSION REDUCTIONS FROM COMMERCIAL AND MULTI-UNIT RESIDENTIAL SPACE AND WATER HEATING [NOX]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	COMMERCIAL/RESIDENTIAL HEATERS/BOILERS			
CONTROL METHODS:	ZERO AND NEAR-ZERO EMISSION BURNERS AND INCENTIVES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	15.7	9.6	9.0	7.1
NOX REDUCTION		TBD	2.7	4.3
NOX REMAINING		TBD	6.3	2.8
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
NOX INVENTORY	9.4	5.8	5.5	4.9
NOX REDUCTION		TBD	1.6	2.9
NOX REMAINING		TBD	3.9	2.0
CONTROL COST:	$20,000 PER TON NOX REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

DESCRIPTION OF SOURCE CATEGORY

Background

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

Regulatory History

Large commercial space heating furnaces are not currently regulated by the SCAQMD unless they have a heat input rating of more than 2 million BTU per hour. Units with

a rating of more than 2 million BTU per hour require a SCAQMD permit and are subject to new source review and a NOx BACT limit of 30 ppm (at a reference level of 3% oxygen). The smallest commercial boilers and water heaters subject to Rule 1146.2 must comply with a NOx emission limit of 20 ppm. Larger boilers meet more stringent emission limits.

PROPOSED METHOD OF CONTROL

This control measure seeks annual average NOx emission reductions of about 2.7 ton per day by 2023 and 4.3 tons/day by 2031 from unregulated commercial furnaces used for space heating and an incentive program is to replace existing commercial and residential boilers, water heaters and space heating furnaces. This control measure will apply to manufacturers, distributors, sellers, installers and purchasers of commercial boilers, water heaters and furnaces used for heating.

One component of this control measure may be to require residential water heaters to meet the heat input based emission limit in Rules 1121 and 1146.2 (pound per million Btu of heat input or parts per million NOx). This would ensure that energy efficiency incentive programs for these residential appliances also achieve NOx emission reductions. Currently these rules allow manufacturers of water heaters the option of meeting a heat input based emission limit or a heat output emission limit (nanograms of NOx per Joule of useful heat output). The heat output option of the emission standard allows high efficiency water heaters to emit the same amount of NOx as standard units heating the same amount of water because high efficiency units are allowed to emit higher concentrations of NOx. All manufacturers have chosen to use the heat output based NOx limit of 10 nanogram/Joule. Because manufacturers use the output based emission limit, replacement of standard efficiency water heaters with high efficiency units does not currently result in lower NOx emissions.

The technology to reduce emissions from commercial space heating equipment is transferrable from residential space heating furnaces and other heating and drying equipment. Currently, most commercial space heaters are unregulated and have NOx emissions in the range of 90 to 110 ppm. The SCAQMD has required residential space heaters to meet a limit of 40 ng/J of heat output (55 ppm) since 1984 under Rule 1111. Starting in 2014, the Rule 1111 emission limit for residential space heaters is 14 ng/J (20 ppm). Low NOx burners are also available for a variety of commercial and industrial heating and drying applications and achieve NOx emission levels of 10 to 30 ppm. Assuming a future NOx emission limit of between 20 ppm to 30 ppm, emissions from a commercial heating unit can be reduced by 60 to 80 percent. The emission reductions specified in the table above assume that the measure will be implemented starting in 2020-2022 with a rule adopted in 2017-2018.

The second component of this control measure is to incentivize the replacement of older boilers, water heaters and space heaters with new and more efficient low NOx boilers, water heaters and space heaters or zero-emitting alternative technology. The new boilers and water heaters will comply with SCAQMD rule emission limits and new commercial space heaters would need to meet a specified emission limit.

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

EMISSION REDUCTIONS

The commercial space heating inventory must be refined in order to clarify the amount of natural gas used by commercial space heaters compared to hydronic (boiler-based) space heating. However, based on national estimates of floor space for different types of buildings and uses, staff estimates that 45 to 60 percent of all commercial, light manufacturing, warehouse, office, school and government building floorspace is heated by commercial forced air units. This control measure seeks 30 percent NOx emission reductions (1.6 ton per day[1]) by 2023 and 60 percent NOx emission reductions (2.9 tons/day[1]) by 2031 from new emission limits for commercial space heating furnaces and replacement of space heating furnaces, boilers and water heaters with new lower or zero emission and higher efficiency units through incentives. Growth and energy efficiency programs will affect the anticipated reduction from this control measure. For instance, equipment may be replaced on an accelerated schedule due to regulations or incentives to increase the efficiency of these units. Reduced fuel use due to increased efficiency may also lower NOx emissions.

RULE COMPLIANCE AND TEST METHODS

SCAQMD Method 100.1

COST EFFECTIVENESS

Based on the cost effectiveness of rules for other heating equipment (Rules 1111, 1121, 1146.2 and 1147), staff estimates the cost effectiveness for the proposed rule regulating commercial space heaters at $20,000 per ton.

[1] Summer planning inventory

IMPLEMENTING AGENCY

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

REFERENCES

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

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

EMISSION REDUCTIONS FROM NON-REFINERY FLARES [NOX]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	LANDFILLS, WASTEWATER TREATMENT PLANTS, OIL AND GAS FACILITIES, COMPOSTING SOURCES			
CONTROL METHODS:	BACT FLARES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
NOx INVENTORY	2.4	2.7	2.7	2.9
NOx REDUCTION		N/A	1.35	1.45
NOx REMAINING		N/A	1.35	1.45
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
NOx INVENTORY	2.4	2.7	2.7	2.9
NOx REDUCTION		N/A	1.35	1.45
NOx REMAINING		N/A	1.35	1.45
CONTROL COST:	$XXX PER TON *NOx* REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

DESCRIPTION OF SOURCE CATEGORY

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

Background

A survey of permits for landfill and waste treatment plant flares indicates NOx emissions range from 0.12 to 0.025 pound per million BTU (BACT since 2006) depending on the age of the flare used to handle gas. Flare NOx emissions are regulated through new source review and BACT, but there are currently no source-specific rules regulating NOx emissions from flares at these sources. Landfill flares have been identified as significant emitters of NOx.

Regulatory History

There are no source specific rules regulating NOx emissions from the handling of gas with non-refinery flares.

PROPOSED METHOD OF CONTROL

The proposed method of control would be in two levels: 1) capturing the gas that would typically be flared and converting it into a renewable energy source and 2) the installation of newer flares implementing the best available control technology.

Waste gas that is flared can be harnessed and conditioned to fuel natural gas vehicles, or produce electricity, or be injected into a natural gas pipeline for these or other purposes such as heating, cooking, and fireplaces. The gas would be required to undergo treatment to remove any impurities and to raise the heating value to specification. For example, the gas from landfills and wastewater treatment plants is often about half the heating value of pipeline quality natural gas. Utilization of waste gas as a transportation fuel can be both economically and environmentally beneficial.

If there is no option for a facility to employ any of the above mentioned methods of waste gas utilization, the gas would need to be reinjected or combusted through flares. However, many existing flares are older and are higher emitting. The equipment survey showed an emission rate of 0.025 pounds of NOx per million BTU of input gas is achievable. Recently, however, there are newer flares capable of achieving 0.018 lb/MMBTU, or 15 ppm NOx at 3% oxygen. These devices are clean enclosed burner (CEB) flares and they have been installed across a range of applications, including the source categories targeted by this control measure. These devices achieve the VOC destruction of the fuel stream, while producing lower NOx emissions. There have been NOx emissions reported lower than the emission rate of 0.025 lb/MMBTU. This control measure proposes that, consistent with all feasible control measures, all non-refinery flares meet current BACT for NOx emissions and thermal oxidation of VOC.

EMISSION REDUCTIONS

Based on facility reported emissions (2010), the annual average emissions for non-refinery flares are about 2 tons per day of NOx. The average emission factor for biogas flares at facilities in the SCAQMD is 0.056 pounds per million BTU (unweighted average), higher than the most stringent emission rate for biogas. Emissions vary by season and are affected by other operations at landfills and treatment plants. Staff estimates an average emission reduction of about 50 percent is achievable if all flares meet the most stringent current BACT limit of 0.025 pound NOx per million BTU of biogas. Lower emission levels would be achieved with the installation of Clean Enclosed Burner (CEB). CEBs are designed to accommodate varying gas compositions and feed rates while maintaining emissions at low levels. NOx reduction would also be achievable for source categories such as oil and gas production wells, tank farms, composting facilities, and even with replacement of traditional thermal oxidizers.

RULE COMPLIANCE AND TEST METHODS

SCAQMD Method 100.1.

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

CEB Clean Enclosed Burner, Flare Industries Presentation, West Coast Air and Waste Management Association, August 23, 2012.

EMISSION REDUCTIONS FROM RESTAURANT BURNERS AND RESIDENTIAL COOKING

[NOX]

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

DESCRIPTION OF SOURCE CATEGORY

Background

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

Regulatory History

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

PROPOSED METHOD OF CONTROL

This proposed control measure would seek NOx reductions from residences, retail restaurants and quick service establishments utilizing commercial cooking ovens,

ranges, fryers and charbroilers by funding development of, and promoting and incentivizing the use and installation of low NOx burner technologies. In addition, the SCAQMD will consider developing a manufacturer based rule to establish emission limits for these cooking appliances. It should be noted that direct PM emissions from meat cooking on under-fired charbroilers are sought for control under control measure BCM-01 – Further Emission Reductions from Commercial Cooking

EMISSION REDUCTIONS

The 2016 AQMP inventory identifies NOx emissions from fuel combustion in residential, service and commercial operations. A significant portion of those emissions are from cooking operations. The NOx emissions from residential and commercial cooking operations result in daily emissions of about 4.3 tons of NOx. The emission reduction targeted by this control measure is 1.5 tons per day.

RULE COMPLIANCE AND TEST METHODS

SCAQMD Method 100.1

COST EFFECTIVENESS

Based on cost effectiveness for other SCAQMD rules regulating NOx emissions from combustion sources, staff estimates the cost effectiveness for this control measure will be in the range of $15,000 to $30,000 per ton.

IMPLEMENTING AGENCY

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

REFERENCES

California Energy Commission, “Characterizing the Energy Efficiency Potential of Gas-Fired Commercial Foodservice Equipment” [CEC-500-2014-095] (2014).

FURTHER NO_X REDUCTIONS FROM RECLAIM ASSESSMENT [NOX]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	VARIOUS RECLAIM NO_X SOURCES			
CONTROL METHODS:	VARIOUS CONTROL TECHNOLOGIES AND METHODS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
NO_X INVENTORY	26.51	15.6*	14.51*	14.51*
NO_X REDUCTION				5
NO_X REMAINING				9.51
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
NO_X INVENTORY	26.51	15.6	14.51	14.51
NO_X REDUCTION				5
NO_X REMAINING				9.51
CONTROL COST:	$13,500 - $21,000 PER TON NO_X REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

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

DESCRIPTION OF SOURCE CATEGORY

There were approximately 275 facilities in the Regional Clean Air Incentives Market (RECLAIM) program as of the end of compliance year 2013. The RECLAIM program includes facilities with NOx or SOx emissions greater than or equal to four tons per year in 1990 or any subsequent year. A wide range of equipment such as fluid catalytic cracking units, boilers, heaters, furnaces, ovens, kilns, coke calciner, internal combustion engines, and turbines are major sources of NOx or SOx emissions at the RECLAIM facilities. This control measure identifies a series of approaches that can be explored to make the program more effective in ensuring equivalency with command and control regulations implementing BARCT, and to potentially generate further NOx emission reductions at RECLAIM facilities.

Background

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

The RECLAIM program is subject to several legal mandates. The Health and Safety Code requires the District to monitor the advancement in BARCT, and if BARCT advances, the District is required to periodically re-assess the overall facility caps, and to reduce the RTC holdings to a level equivalent to command-and-control BARCT levels. The emission reductions resulting from the programmatic RTC reductions will help the basin attain the National Ambient Air Quality Standards (NAAQS) for ozone and PM2.5 as expeditiously as practicable. The periodic BARCT evaluations must include an evaluation of the maximum degree of reduction achievable with advanced control technologies taking into account the environmental, energy, and economic impacts for each class or category of source.

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

Regulatory History

On October 15, 1993, the SCAQMD's Governing Board adopted Regulation XX – RECLAIM. The RECLAIM program at its inception included 392 NOx facilities. RECLAIM Regulation XX includes 15 rules that specify the applicability, definitions, allocations, trading and operational requirements, as well as monitoring, reporting, and recordkeeping requirements. The NOx RECLAIM regulation has been revised several times, and two significant amendments (2005 and 2015) reflected a BARCT re-assessment. SOx RECLAIM allocations were re-assessed in 2010 based on BARCT.

The January 2005 amendment resulted in a NOx RTC reduction target of 7.7 tons per day (tpd), approximately a 22.5% reduction of the RTC holdings, which was implemented in 5 phases: 4 tpd by 2007 and an additional 0.925 tpd in each of the following 4 years.

The 2015 NOx amendments included a total RTC reduction of 12 tpd, including a Regional RTC Holding account for EGFs to meet their NSR holding obligations. The amendments also contained an optional off-ramp from RECLAIM for EGFs at BACT or BARCT. A Governing Board adopted resolution directed staff to further examine the issue of equipment shut-downs at RECLAIM facilities and the fate of the associated RTCs.

PROPOSED METHOD OF CONTROL

When considering future emissions reductions for AQMP purposes, the NOx RECLAIM program works differently than traditional command and control regulations. Projected future emissions in the AQMP assume all RECLAIM RTC holdings are emitted into the air. Under command and control regulations, future year emissions estimates are based on actual emissions in a base year projected into the future using the best available estimates of economic growth for a particular industry. The RECLAIM program has traditionally included more RTCs than actual emissions. While this margin may provide for market liquidity, it precludes taking future year AQMP emission reduction credit for these unused RTCs. For attainment demonstration purposes, these uncredited emissions reductions would need to be achieved from other non-RECLAIM sources.

Several potential actions and analyses can help to address this issue and other issues that arose during recent NOx RECLAIM amendments. These measures listed below would be designed to achieve additional actual and/or SIP creditable emissions reduction from the RECLAIM Program and ensure equivalency with command-and-control regulations:

- Assess the need for and the size of the differential between RTC holdings and actual emissions. The size of this unused RTC margin is affected by the possible need for a compliance margin, uncertainties in the growth projections for existing and new businesses, facility and equipment shutdowns, and holdings by investors. A full assessment may allow for an optimization of the size of the margin that could allow for further RTC reductions.
- Consider options for facilities at BACT or BARCT and/or facilities with no allocations (structured buyers) to exit the program and be subject to command and control regulations. The most recent NOx amendment allowed EGFs to voluntarily opt-out of RECLAIM. Such an option could be extended to other facilities, and potentially lead to more AQMP creditable emission reductions given that future non-RECLAIM facilities emissions are projected at actual levels with growth rather than total allocations.

- Consider command-and-control regulation overlays to certain RECLAIM facilities. For some RECLAIM facilities a command-and-control overlay may be the best way to reduce NOx emissions while maintaining the required equivalency with command and control.
- Assess facility and equipment shutdowns and the removal of associated RTCs from the market. Under command-and-control rules, shutdown emission credits are heavily discounted to BACT, based on the last 2 years of operation. Currently, for a RECLAIM facility or equipment shutdown, there is no discount of credits. These credits, if not removed from the program, reduce the incentive to implement cost-effective controls that would otherwise be required under command-and-control.
- Assessment of whether the cost-effectiveness benefits that the RECLAIM market was intended to provide still exist given the need for all feasible NOx reductions and the potential lack of lower-cost control options.
- Perform additional or more frequent BARCT assessments and adjust allocations as control technologies improve and are implemented in practice.
- Assess whether more SIP creditable and/or actual emissions reductions could be achieved without the RECLAIM program, and if so, explore how the program could be sunset in an orderly and equitable fashion.
- Reexamination of the RECLAIM program if RTC prices hit the upper or lower threshold amounts. The current NOx RECLAIM regulation has a lower price threshold of $200,000 per ton (infinite year block) and upper price thresholds of $22,500 and $35,000 per ton (discrete year; annual and 3-month average, respectively). The levels of these thresholds or additional thresholds could be modified commensurate with future BARCT assessments and attainment needs.
- Assess the impacts of investors holding RTCs. Investors have historically played an important role in the RECLAIM program. However, their holding of RTCs have posed problems with the trading and identification of reductions because they are not RECLAIM facilities that have an initial allocation or a potential to reduce NOx emissions.

EMISSION REDUCTIONS

Projected emission reductions from the implementation of the NOx RECLAIM assessment efforts is targeted to generate 5 tons per day of NOx emission reductions by 2031.

RULE COMPLIANCE AND TEST METHODS

Compliance with the provisions of this control measure would be based on monitoring, recordkeeping, and reporting requirements that have been established in either the

RECLAIM program or existing source specific rules and regulations. Compliance would be verified through inspections and other recordkeeping and reporting requirements.

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

BARCT Analysis for SCAQMD NOx RECLAIM, Non-Confidential Report, Norton Engineering Consultants, November 26, 2014.

NOx RECLAIM BARCT Independent Evaluation of Cost Analysis Performed by SCAQMD Staff for BARCT in the Non-Refinery Sector. SCAQMD Contract #15343. ETS, Inc.; 2014

SCAQMD, 2015. Draft Final Staff Report on Proposed Amendments to Regulation XX – NOx RECLAIM, December 4, 2015

Item 30, Proposed Amendments to NOx RECLAIM Program (Regulation XX), proposed motion by Supervisor Nelson, December 4, 2015

SCAQMD, 2010. Rule 1110.2 – Emission Reductions from Gaseous and Liquid Fueled Engines, Amended July 9, 2010.

SCAQMD, 2012. Stationary Source Committee, Item #4, Twelve-month Rolling Price of 2010 and 2011 Compliance Years RTCs, April 20, 2012

SCAQMD, 2010-12. Annual RECLAIM Audit Report for 2008 Compliance Year, March 5, 2010; Annual RECLAIM Audit Report for 2009 Compliance Year, March 5, 2010; and Annual RECLAIM Audit Report for 2010 Compliance Year, March 2, 2012.

SCAQMD, 2008. Rule 1146 – Emissions of Oxides of Nitrogen from Industrial and Commercial Boilers, Steam Generators, and Process Heaters, Amended September 5, 2008.

Bay Area, 2006. Regulation 9, Rule 9 – NOx from Stationary Gas Turbines, Amended December 6, 2006.

EPA, Menu of Control Measures - Control Options for Reducing NOx from Point and Area Sources, September 3, 2010.

EPA, Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Petroleum Refining Industry, October 2010.

LBL, 2005. Energy Efficiency Improvement and Cost Saving Opportunities for Petroleum Refineries, Sponsored by the U.S. EPA, Ernest Orlando Lawrence Berkeley National Lab, February 2005.

SJVUAPCD, 2011. Rule 4354 – Glass Melting Furnaces, Amended May 19, 2011.

SJVUAPCD, 2011. Rule 4702 – Internal Combustion Engines, Amended August 18, 2011.

SJVUAPCD, 2008. Rule 4320 – Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater Than 5 MMBTU/hr, Adopted October 16, 2008.

SJVUAPCD, 2007. Rule 4703 – Stationary Gas Turbines, Amended September 20, 2007.

IMPROVED EDUCATION AND PUBLIC OUTREACH [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY

SOURCE CATEGORY: RESIDENTIAL, COMMERCIAL, INDUSTRIAL, AND TRANSPORTATION SOURCES

CONTROL METHODS: INCREASED AWARENESS, INCENTIVE PROGRAMS, AND TECHNICAL ASSISTANCE IN MAKING LOW EMITTING PURCHASES, IMPLEMENTING EFFICIENCY PROJECTS, AND CONSERVATION TECHNIQUES

EMISSIONS (TONS/DAY):

ANNUAL AVERAGE*	**2012**	**2022**	**2023**	**2031**
POLLUTANT INVENTORY	N/A	N/A	N/A	N/A
POLLUTANT REDUCTION		N/A	N/A	N/A
POLLUTANT REMAINING		N/A	N/A	N/A
SUMMER PLANNING*	**2012**	**2022**	**2023**	**2031**
POLLUTANT INVENTORY	N/A	N/A	N/A	N/A
POLLUTANT REDUCTION		N/A	N/A	N/A
POLLUTANT REMAINING		N/A	N/A	N/A

CONTROL COST: N/A

IMPLEMENTING AGENCY: SCAQMD & OTHER PARTIES

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

DESCRIPTION OF SOURCE CATEGORY

This proposed control measure seeks to provide education, outreach, and incentives for consumers to contribute to clean air efforts. Examples include consumer choices such as the use of energy efficient products, new lighting technology, "super compliant" coatings, tree planting, transportation choices, and the use of lighter colored roofing and paving materials which reduce energy usage by lowering the ambient temperature. In addition, this proposed measure intends to increase the effectiveness of energy conservation programs through public education and awareness as to the environmental and economic benefits of conservation. Educational and incentive tools to be used include social comparison applications (comparing

your personal environmental impacts with other individuals), social media, and public/private partnerships. Further improvement of outreach allows the public to alert staff of any environmental problems that need attention.

Background

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

This measure seeks to increase awareness of the benefits of purchasing low emitting products and promote further implementation of efficiency and conservation projects**.** When making purchases such as new cars, yard equipment, or household products, there are several factors consumers consider, but emissions and health benefits are typically not considerations. To help make emissions an important factor in purchasers' decision-making process, the SCAQMD has several existing outreach and education programs in place such as Clean Air Choices[1], educational materials, conferences, and outreach to specific communities throughout the Basin. Providing additional outreach and education regarding clean air choices will help consumers consider the emission benefits of their purchases. In some instances, these purchases include efficiency gains that will decrease longer term operating costs, and thus provide a built-in financial incentive. Providing specific outreach and education on these potential cost savings will help increase penetration of such low emitting technologies and practices.

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

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

[1] http://www.cleanairchoices.org/

smog-forming pollutants from the Southland's air. Similarly, the total number of old, polluting leaf blowers that have been scrapped exceeds 10,000[2].

The SCAQMD will also help to promote potential efficiency benefits for existing equipment and structures. There are several reasons why many efficiency projects are not undertaken. In many instances tools, incentive programs, and loan programs for efficiency upgrades are not adequately described, advertised, or consolidated. Certain projects require high initial capital costs, despite relatively fast payback periods, which serves as a barrier to implementation. In addition, technical barriers prevent many system operators, home owners, and building maintenance crews from utilizing existing tools and implementing efficiency projects. The SCAQMD staff will help develop technical outreach to residents and businesses to help implement projects that have emission benefits and short payback periods. The SCAQMD staff may also examine ways to provide assistance through additional incentive programs and/or loan products to defray or amortize capital costs on certain efficiency projects.

Regulatory History

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

PROPOSED METHOD OF CONTROL

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

EMISSION REDUCTIONS

Predicting emission reductions from these activities is not possible at this time due to the voluntary nature of the control measure. Outreach and education components will have emission benefits that can perhaps be quantified later based on program evaluation,

[2] http://www.aqmd.gov/home/programs/community/community-detail?title=lawn-equipment

technology penetration, and other assessment and inventory methods. Implementing additional incentive programs will provide a means to quantify these benefits as they are developed. Emission reductions achieved from these activities will be incorporated into the subsequent SIP revisions once projects are implemented.

RULE COMPLIANCE AND TEST METHODS

Not applicable.

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

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

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

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

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

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

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

IMPROVED BREAKDOWN PROCEDURES AND PROCESS RE-DESIGN [ALL POLLUTANTS]

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

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

DESCRIPTION OF SOURCE CATEGORY

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

Background

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

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

Regulatory History

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

PROPOSED METHOD OF CONTROL

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

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

EMISSION REDUCTIONS

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

RULE COMPLIANCE AND TEST METHODS

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

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

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

IMPROVED LEAK DETECTION AND REPAIR [VOC]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	FUGITIVE EMISSION SOURCES			
CONTROL METHODS:	IMPROVED/EXPANDED LEAK DETECTION PROGRAMS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY*	14	7.7	7.1	6.2
VOC REDUCTION		N/A	2	2
VOC REMAINING		7.7	5.1	4.2
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY*	14	7.7	7.1	6.2
VOC REDUCTION		N/A	2	2
VOC REMAINING		7.7	5.1	4.2
CONTROL COST:	$11,000 PER TON VOC REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

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

DESCRIPTION OF SOURCE CATEGORY

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

Background

Fugitive VOC leaks have been the subject of control measures in previous AQMPs since VOCs are ozone and PM2.5 precursors and some VOCs have toxic properties. Several SCAQMD rules that affect petroleum and chemical-related industries, such as oil refineries, oil and gas production fields, natural gas processing plants, pipeline transfer stations and chemical plants have requirements involving the periodic inspection of piping components and the detection and repair of leaks.

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

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

In September 2014, U.S. EPA finalized a rule imposing more stringent fugitive emission control requirements of hazardous air pollutants (HAPs) for flares, coking units and catalytic reforming unit vents of petroleum refineries (http://www.epa.gov/ttn/atw/petref.html). To ensure that proposed standards are being met, and to protect public from exposure to HAPs, no later than three years after the effective date of the final rule, EPA will require monitoring of benzene concentrations at the fenceline of refineries using passive sensors networks, collecting 2-week rolling averaged benzene concentrations. The not to exceed two-week rolling average benzene concentration at the refinery fenceline is set at 9 µg/m3 (equivalent to approximately 3 ppb). In recognition of recent advances in ORS technology, the new rule also allows facilities to use alternative test methods in order to satisfy the benzene monitoring requirements.

Based on experience gained from previous remote sensing fenceline monitoring studies and a pressing need for early detection capabilities and improved estimates of

fugitive emissions, it is prudent to continue to expand SCAQMD remote sensing capabilities. To accomplish this goal, in September – October 2015 SCAQMD conducted a comprehensive measurement campaign aimed to fully characterize technologies that quantify fugitive and stack emissions from large refineries and other important VOC sources in the SCAB such as oil wells and gas stations. The analysis of collected data is in progress.

Regulatory History

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

PROPOSED METHOD OF CONTROL

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

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

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

Rule 463 - Storage of Organic Liquids and 1178 - Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities are two rules that utilize a self-inspection program. Rules 1173 - Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum and Chemical Plants and 1176 - Sumps and

Wastewater Separators incorporate an LDAR program. Under this control measure, these rules would be candidates for further improvements in current work practices through the use of new detection technology.

For new detection technology this control measure will be implemented in two phases: Phase I will be a pilot LDAR program to demonstrate feasibility with the new technology and to establish implementation protocols. The completion of phase I will result in the identification of facilities/industries currently subject to LDAR programs and identification of those where the new technology is not yet ready to be utilized. Based on the results of Phase I, fugitive VOC rules will be amended as appropriate under the subsequent phase (Phase II) to enhance their applicability and effectiveness, and to further achieve emissions reductions.

EMISSION REDUCTIONS

Implementing an LDAR program to source categories that are currently not subject to such programs and/or augmenting current and new LDAR programs with the optical gas imaging capabilities would further reduce fugitive emissions by improving operators' ability to detect leaking components and accelerate repairs. Emission reductions are estimated at 1-2 tons per day.

RULE COMPLIANCE

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

TEST METHODS

Test methods include the following:

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

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

COST EFFECTIVENESS

Cost effectiveness for this control measure is approximately $11,000 per ton VOC reduced.

IMPLEMENTING AGENCY

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

REFERENCES

SCAQMD - VOC Controls White Paper, 2015

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

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

FURTHER EMISSION REDUCTIONS FROM COATINGS, SOLVENTS, ADHESIVES, AND LUBRICANTS [VOC]

CONTROL MEASURE SUMMARY

SOURCE CATEGORY: MISCELLANEOUS COATINGS, SOLVENTS, ADHESIVES AND LUBRICANTS

CONTROL METHODS: REDUCE THE ALLOWABLE VOC CONTENT IN PRODUCT FORMULATIONS OR PROVIDE INCENTIVES FOR VOLUNTARY REDUCTIONS

EMISSIONS (TONS/DAY):

ANNUAL AVERAGE	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	47	56	57	62
VOC REDUCTION		N/A	1	2
VOC REMAINING		56	56	60
SUMMER PLANNING	**2012**	**2022**	**2023**	**2031**
VOC INVENTORY	49	58	59	64
VOC REDUCTION		N/A	1	2
VOC REMAINING		58	58	62

CONTROL COST: $8,000 TO $12,000 PER TON VOC REDUCED

IMPLEMENTING AGENCY: SCAQMD

DESCRIPTION OF SOURCE CATEGORY

This proposed control measure seeks volatile organic compound (VOC) emission reductions by focusing on select coating, adhesive, solvent and lubricant categories by further limiting the allowable VOC content in formulations or incentivizing the use of super-compliant technologies. Examples of the categories to be considered include but are not limited to, coatings used in aerospace applications; adhesives used in a variety of sealing applications; solvents for graffiti abatement activities; and lubricants used as metalworking fluids to reduce heat and friction to prolong life of the tool, improve product quality and carry away debris. Reductions could be achieved by lowering the VOC content of the coatings,

solvents, adhesives and lubricants where possible, but reductions could also be achieved by promoting the use of alternative low-VOC products or non-VOC product/equipment at industrial facilities.

Background

Use of super-compliant zero- and near-zero VOC materials eliminate or substantially reduce emissions compared to similar products that are not zero- or near-zero products.. There are several product categories where these materials perform as well as traditional products and are widely available in the market. Incentives to promote the use of super-compliant products containing no or little VOCs during ozone season could reduce ozone concentrations when exceedances are typically experienced.

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

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

The 2016 AQMP control strategy continues to focus on NOx reductions, with additional strategic and cost-effective VOC reductions, as the best way to minimize the general public's exposure to unhealthy ozone pollution not only in the target attainment year, but also during the course of the control effort. The analysis in the VOC Controls White Paper (SCAQMD, 2015) indicates that a NOx-heavy strategy accompanied by more modest VOC reductions will help to avoid temporary increases in ozone concentrations in the western side of the Basin. This finding reaffirms the previous NOx-heavy State Implementation Plan (SIP) strategies to meet both PM2.5 and ozone standards. A strategic VOC control program is recommended for the 2016 AQMP to first maximize co-benefits of NOx, GHG, and air toxic controls, followed by controls that could create a "win-win" "business case" for the affected entities, incentives for super-compliant products, while ensuring and capturing benefits from implementation of existing rules. When additional VOC controls are still needed, it is recommended to prioritize controls that will produce co-benefits for air toxics and GHGs, with a focus on VOC species that are most reactive in ozone and/or PM2.5 formation.

Regulatory History

The VOC rules that may be affected by this control measure are as follows:

- Rule 1113 – Architectural Coatings
- Rule 1124 – Aerospace Assembly and Component Manufacturing Operations
- Rule 1144 - Metalworking Fluids and Direct-Contact Lubricants
- Rule 1168 - Adhesive and Sealant Applications
- Rule 1171 - Solvent Cleaning Operations

PROPOSED METHOD OF CONTROL

Reductions would be achieved by lowering the VOC content of select few categories within the above-mentioned source-specific rules rather than relying on across the board lowering of VOC limits. For solvents, reductions could be achieved with the use of alternative low-VOC products or non-VOC product/equipment at industrial facilities. The proposal is anticipated to be accomplished with a multi-phase adoption and implementation schedule.

Enhanced enforcement and the tightening of regulatory exemptions that may be used as loopholes in lieu of compliant technologies can also lead to reduced emissions.

EMISSION REDUCTIONS

Current estimates are that there is a potential VOC emission reduction of about 2.0 tons per day by 2031.

RULE COMPLIANCE AND TEST METHODS

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

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

VOC Controls White Paper (2015)

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

Material Safety Data Sheets

Product and Technical Data Sheets

STATIONARY SOURCE VOC INCENTIVES [VOC]

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

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

DESCRIPTION OF SOURCE CATEGORY

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

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

Background

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

Regulatory History

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

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

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

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

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

PROPOSED METHOD OF CONTROL

This control measure would seek to incentivize VOC emissions reductions from various stationary and area sources through incentive programs for the use of clean, low emission materials or processes. Facilities would be able to qualify for incentive funding if they utilize equipment or material, or accept permit conditions which result in cost-effective emissions

reductions that are beyond existing requirements. The program would establish procedures for quantifying emissions benefits from clean technology implementation and develop cost-effectiveness thresholds for funding eligibility.

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

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

1. Provide incentives to replace older higher-emitting equipment or material with newer lower emitting equipment or material for area and stationary sources, which can apply to a single source or resident, or an entire facility.

2. Provide incentives for existing residences and businesses to implement zero and near-zero emission technologies throughout their operations.

3. Encourage new businesses that use and/or manufacture near-zero and zero emission technologies to site in the Basin.

Through the years, a variety of incentives have been implemented, such as exempting cleaner sources from permitting, implementing measures to streamline permit processing for cleaner sources, use of short-term mobile source credits, mitigation fee programs, the Air Quality Investment Program (AQIP), and emissions averaging provisions in rules. The incentive programs, which include incremental funding or subsidies, are designed to promote voluntary introduction of new technologies on an accelerated schedule. These programs may also provide manufacturers with incentives to accelerate the deployment of cleaner technologies.

For stationary sources, the SCAQMD staff has compiled a list of potential incentives to encourage businesses to use zero- or near zero technologies or enhancements to the SCAQMD's existing programs to reduce or eliminate barriers to implement state of the art technologies. The list below represents an "initial list" of potential concepts. It is expected that as the SCAQMD staff and stakeholders further explore incentives, additional concepts may be identified while others may be removed. By providing this initial list of incentives, the SCAQMD staff is not endorsing any specific incentive. However, the SCAQMD staff is committed to further investigating the concepts.

- **Incentive Funding:** The concept of incentive funding involves the creation of economic incentives to reduce the cost and encourage businesses to replace their existing high emitting equipment or material with equipment or material that is zero- or near-zero

emitting. It includes mechanisms such as loans and grants. Funding for these programs could derive from mitigation fees, penalty or settlement fees, or federal or state grants and programs.

- **Permitting and Fee Incentives and Enhancements:** Permitting and fee incentives and enhancements would include the expansion of the existing certification program and pre-approved permit program to include additional qualified categories. Incentives involving reduced permitting fee programs for advanced technologies which significantly reduce emissions as well as other permitting enhancements identified as priority projects are also discussed in this incentive approach.
- **NSR Incentives and Enhancements:** The mechanism of credit offsets and NSR incentives includes expanding the number of exemptions under Rule 1304 - Exemptions and expanding the use of the priority reserve under Rule 1309.1 – Priority Reserve. In addition this mechanism includes the adoption of a Clean Air Investment Fund and the short-term leasing of offset credits.
- **CEQA Incentives:** CEQA incentives will focus on mechanisms the SCAQMD staff can affect in the CEQA process such as expedited review.
- **Branding Incentives:** The concept of branding incentives is to recognize businesses or equipment for reach a superior level of air quality excellence. Branding incentives can vary from recognition awards to specific labeling or certification.
- **Recordkeeping and Reporting Incentives:** The concept of recordkeeping and reporting incentives is to reduce the recordkeeping and reporting requirements for specific zero and near-zero emission technologies.

EMISSION REDUCTIONS

Predicting VOC emission reductions from these voluntary activities is challenging, however, when providing incentives, the modernization of facilities could take place in the both the short- and long-term. The availability and amount of incentives would directly affect the level of VOC emission reductions achieved. In the long-term, the control measure could reasonably achieve a higher percent reduction particularly since facilities and equipment will get older over time and become less efficient. Thus, any effort to modernize will result in a larger VOC emission reduction. Emission benefits from incentives can be quantified based on program participation, technology/material penetration, and other assessment and inventory methods. Implementing additional incentive programs will provide a means to quantify these benefits as they are developed. Updated emission reductions achieved from these activities will be incorporated into the subsequent SIP revisions as projects are implemented.

RULE COMPLIANCE AND TEST METHODS

Not applicable.

COST EFFECTIVENESS

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

The SCAQMD has implemented several funding programs to help facilitate specific technologies and compliance with SCAQMD rules. One such effort involved the establishment of the Rule 1470 Risk Reduction Fund in May 2012. This fund was adopted by the SCAQMD Governing Board to set aside $2.5 million to offset the cost of purchasing diesel particulate filters for new diesel emergency standby engines as required under Rule 1470 - Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines. Another program is the Dry Cleaner Financial Incentive Grant Program which was designed to assist local dry cleaners to switch to non-perchloroethylene dry cleaning systems to comply with Rule 1421 - Control of Perchloroethylene Emissions from Dry Cleaning Systems. Up to $20,000 was available for CO_2 machines and $10,000 for water-base system machines. For a limited time, $5,000 was available for hydrocarbon machines. Since 2008, the program has provided approximately $265,000 to local dry cleaners in order to upgrade their systems. In addition, there are several existing incentive programs which help promote higher efficiency and lower emitting technologies such as the: Lawn Mower and Leaf Blower Exchange; SOON Program; Carl Moyer Memorial Air Quality Standards Attainment Program; MSERC Credit Programs; and Voucher Incentive Program.

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

IMPLEMENTING AGENCY

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

REFERENCES

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

EMISSION REDUCTIONS FROM GREENWASTE COMPOSTING [VOC, NH3]

CONTROL MEASURE SUMMARY					
SOURCE CATEGORY:	GREENWASTE AND/OR FOODWASTE COMPOSTING EMISSION REDUCTIONS				
CONTROL METHODS:	ORGANIC WASTE PROCESSING TECHNOLOGY AND RESTRICTION ON THE USE OF UNCOMPOSTED GREENWASTE				
EMISSIONS (TONS/DAY):					
ANNUAL AVERAGE	**2012**	**2021**	**2023**	**2025**	**2031**
VOC INVENTORY*	2.94	3.86	4.23	4.63	4.89
VOC REDUCTION		1.40	1.54	1.68	1.78
VOC REMAINING		2.46	2.69	2.95	3.11
NH3 INVENTORY*	0.42	0.54	0.60	0.65	0.69
NH3 REDUCTION		0.08	0.08	0.09	0.10
NH3 REMAINING		0.46	0.52	0.56	0.59
CONTROL COST:	$1,350 PER TON OF VOC REDUCED $25,000 PER TON OF NH3 REDUCED				
IMPLEMENTING AGENCY:	SCAQMD				

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

DESCRIPTION OF SOURCE CATEGORY

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

This control measure proposes (1) potential emission minimization through organic waste processing technology and (2) potential emission reductions through the restricted use of chipped and ground uncomposted greenwaste.

Background

The California Integrated Waste Management Act of 1989 (AB 939) established a new direction for waste management in the State of California and set up a new mandate for local jurisdictions to meet a solid waste diversion goal of 50 percent by 2000 to conserve resources and extend landfill capacity. California's statewide landfill diversion rate has steadily increased to 54 percent in 2006 and to 65 percent in 2011 (Edgar & Associates, 2013).

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

Two pieces of legislation, AB 1826 (Chesbro) and AB 1594 (Williams), signed in 2014, are expected to lead to significant increases in the amount of organic waste available for composting and anaerobic digestion. AB 1826 requires the State's commercial sector to recycle their organic waste (food scraps and yard trimmings) on and after April 1, 2016, depending on the amount of waste they generate per week. The minimum threshold of organic waste generation by businesses will decrease over time. On and after January 1, 2016, this law also requires local jurisdictions to have an organic waste recycling program in place to divert organic waste generated by businesses. Under AB 1594, commencing January 1, 2020, use of green material as an ADC at landfills no longer would constitute diversion, and would be considered to be disposal for purposes of compliance with the State's mandated 50 percent diversion from disposal required by AB 939. Commencing August 1, 2018, local jurisdictions are required to include information in an annual report to CalRecycle on how the local jurisdiction intends to address these diversion requirements and divert green material that is being used as ADC. In addition to these bills, CARB Short-Lived Climate Pollutant (SLCP) Strategy outlines a goal of 90 percent organic waste diversion by 2025 (CARB, 2015). To help achieve this goal, the SLCP proposes that CARB and CalRecycle consider development of a regulation by 2018 to require waste management agencies to effectively eliminate the disposal of organic waste in landfills by 2025.

Currently, an estimated 35 million tons of waste are disposed of in California's landfills annually, of which 32 percent is compostable organic materials, 29 percent is construction and demolition debris, and 17 percent is paper. Among the organic materials disposed of, about 20 percent is food scraps and green materials, such as grass, leaves, prunings, and trimmings (CalRecycle, 2008). With the State's 75 percent organic recycling goal by 2020 and AB 1826, and also with the CARB SLCP Strategy, processing of food scraps and greenwaste is expected to grow via composting or anaerobic digestion. Greenwaste chipping and grinding activities are expected to grow concurrently.

Regulatory History

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

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

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

PROPOSED METHOD OF CONTROL

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

- Emerging Organic Waste Processing Technology: An emerging organic waste processing technology (e.g., Regreen Technologies) is in the process of becoming commercially available to process foodwaste, greenwaste, and palm fronds into beneficial soil amendments, fuels for power generation, and animal feeds. This technology is able to process these waste materials without going through the

microbial decomposition of organic materials, concurrently killing harmful pathogens in the waste materials and thereby minimizing VOC and ammonia generation from the process. Estimated equipment costs for this technology is expected to range between $300,000 for smaller application (0.5 tons/hour) and up to $3.6 million for larger, full scale application (5 tons/hour).

- Restrictions on the Use of Chipped and Ground Uncomposted Greenwaste: Curbside and non-curbside greenwaste is chipped and ground to produce mulch that is used as a ground cover material on public land (e.g., for erosion control or soil reclamation). There is high potential to emit air pollutants from land applied mulch as the material may undergo microbial decomposition over time because it would not be well managed or controlled once being spread. If uncomposted and untreated, mulched greenwaste may cause not only airborne emissions, but also threaten the environment and public health from possible pathogen contamination. A recent study showed that DLA of chipped and screened but uncomposted greenwaste had significant VOC emissions occurring from greenwaste applied on soil surface (Burger et al., 2015).

  This proposed control method would seek restrictions on the use of compostable (both curbside and non-curbside) chipped and ground mulch on public land. Potential restrictions include, but are not limited to, requiring minimum composting BMPs for chipped and ground uncomposted mulch before DLA, such as six inches of finished compost cover and watering, as needed, for the first 15 days of the active phase composting, as established in Rule 1133.3. About 40 percent of VOC and 20 percent of NH3 reductions are estimated from implementing the proposed composting BMPs. This proposed time period is equivalent to a pathogen reduction period for windrow composting that is required in California Code of Regulations (CCR) Title 14, Chapter 3.1,[1] and is shorter than the full composting process of at least 62 days. The proposed control method would require pseudo-biofilter cover material (e.g., compost overs or finished compost) and watering, as necessary, for the first 15 days of the active composting period. This does not conflict or duplicate Title 14 pathogen reduction requirements.

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

EMISSION REDUCTIONS

- Emerging Organic Waste Processing Technology: This technology does not go through composting process and thus, if implemented, forgoes possible future emissions of air pollutants (VOCs and ammonia) or odorous gases. Although waste diversion would result in an emissions benefit, the actual reductions are not

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

quantifiable at this time.

- Restrictions on the Use of Uncomposted Greenwaste: Baseline VOC and NH3 inventories are estimated using the 2012 base year throughput of mulch as a product of greenwaste chipping and grinding and baseline greenwaste composting emission factors. Projected VOC and NH3 inventories are estimated by considering the 2012 base year throughput, baseline emission factors, and growth factors, including the anticipated mulch throughput growth due to the statewide landfill diversion goals (75% by 2020 and 90% by 2025) and the countywide household growth. Mulch is part of the greenwaste chipping/grinding products. Therefore, to make the estimates more realistic, staff factored the incremental organic waste diversion rates from 2011 to 2020 (i.e., 1.11% increase each year) and from 2021 to 2025 (i.e., 3% increase each year) in the calculation of the overall mulch throughput growth. By implementing the proposed composting BMPs, 40% of VOC and 20% of NH3 reductions are estimated from the active phase composting of chipped and ground mulch. To fully assess this item, an additional emission source test may be needed to improve emissions characterization from chipped and ground uncomposted mulch. An industry survey may also be needed to obtain how much material is processed through what means to better characterize material disposal methods.

RULE COMPLIANCE AND TEST METHODS

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

COST EFFECTIVENESS

Cost effectiveness for this control measure is estimated to be $1,350 per ton of VOC reduced and $25,000 per ton of NH3 reduced as a co-benefit. Note that cost effectiveness figure for NH3 is high because emission reductions are low. However because the reductions are derived from the same control method targeted for VOC reductions, the concurrent co-benefit would not result in a net increase in overall cost for control.

IMPLEMENTING AGENCY

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

REFERENCES

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4. SCAQMD, Rule 1133 – Composting and Related Operations-General Administrative Requirements, Adopted January 10, 2003.

5. SCAQMD, Final Staff Report for Proposed Amended Rule 1133.1 and Proposed Rule 1133.3, July 2011.

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FURTHER EMISSION REDUCTIONS FROM COMMERCIAL COOKING [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	UNDER-FIRED CHARBROILERS		
CONTROL METHODS:	ADD-ON CONTROL EQUIPMENT WITH VENTILATION HOOD REQUIREMENTS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY	10.4	11.9	12.3
PM2.5 REDUCTION		2.7*	2.7*
PM2.5 REMAINING		9.2	9.6
CONTROL COST:	$10,000 -$15,000/TON		
IMPLEMENTING AGENCY:	SCAQMD		

**Reductions are approximate and will be submitted into the SIP once final feasible control levels are established.*

DESCRIPTION OF SOURCE CATEGORY

This proposed control measure would seek PM reductions from commercial under-fired charbroilers.

Background

Cooking activities are the largest source of directly emitted 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. However, under-fired charbroilers are responsible for the majority of emissions from this source category (2007, SCAQMD) given the higher emission potential when compared with other cooking devices (e.g., 32.5 lb per 1,000 lb of meat cooked via under-fired-charbroiler compared to 5 lb PM per 1,000 lb of meat cooked via a griddle). An under-fired charbroiler consists of three main components: a heating source, a high temperature radiant surface, and a slotted grill (grate). The grill holds the meat or other food while exposing it to the radiant heat. PM and VOC emissions occur when grease from the meat falls onto the high temperature radiant surface. Most under-fired charbroilers burn natural gas; however, solid fuels, such as charcoal or wood with or without the addition of ceramic stones, are sometimes used.

Regulatory History

Efforts to reduce PM emissions from commercial cooking activities have been included in AQMP control measures since the early 1990s. While the goal has been to develop a comprehensive rule applicable to all commercial cooking activities the only available, cost-effective PM control was initially limited to chain-driven under-fired broilers. In 1997, the SCAQMD Governing Board adopted Rule 1138 - Control of Emissions from Restaurant Operations, which requires chain-driven charbroilers to install a catalytic oxidizer (or equivalent) control device. These types of charbroilers were uniquely suited for the implementation of commercially available, low cost catalyst oxidizers (flameless incineration) which operate with the necessary exhaust temperature of 700-800º F. Rule 1138 applies to commercial cooking operations with chain-driven charbroilers cooking more than 875 pounds of meat per week and required control devices must be certified to achieve an 83 percent reduction in PM emissions.

Since adoption of Rule 1138, SCAQMD staff efforts to reduce emissions from commercial cooking operations have been focused on under-fired charbroilers and a series of reports were made to the SCAQMD Governing Board in 1999, 2001, and 2004 to present results of under-fired charbroiler control technology research. Affordable controls were not commercially available at that time for under-fired charbroilers.

In 2007, the Bay Area Air Quality Management District (Bay Area AQMD) adopted Regulation 6, Rule 2 (Commercial Cooking) which included provisions for both chain-driven and under-fired charbroilers. The Bay Area regulation requires a catalytic oxidizer for chain-driven charbroilers with a throughput of at least 400 pounds of beef per week. Under-fired charbroilers with more than 10 square feet of cooking area are required to limit emissions to 1 pound of PM10 per 1,000 pounds of cooked beef (greater than 90% reduction in emissions) under the Bay Area rule. As a result of the Bay Area regulation, a subsequent SCAQMD rule development effort to control PM emissions from under-fired charbroilers was initiated in 2008. A Working Group of approximately 35 members from affected industry, equipment manufacturers and researchers was formed to initially discuss current research and later to provide comment on draft rule language (SCAQMD, 2009). Three working group meetings were held in 2008 and 2009 and a public workshop was held in August 2009. Due to concerns over control device availability and initial equipment costs affecting small businesses, Proposed Rule 1138 amendments were postponed. Instead, SCAQMD initiated further research on under-fired charbroiler control technologies with the goal of identifying and testing lower cost devices.

Control Technology Research

In October 2011, the SCAQMD Governing Board approved approximately $200,000 for control device testing and authorized the release of a Program Opportunity Notice (PON) to solicit proposals from control device manufacturers (SCAQMD, 2011). Under the PON process, SCAQMD staff and an inter-agency working group consisting of representatives from U.S. EPA, San Joaquin Valley APCD and Bay Area AQMD reviewed manufacturer proposals based on anticipated emission reductions and available cost data. Equipment showing promise would be subject to an initial

screening test. Based on screening results, equipment could be tested using the full SCAQMD Test Protocol for Determining PM Emissions from Under-fired Charbroilers. All testing was initially funded by SCAQMD and conducted under an existing contract with the University of California at Riverside – Center for Environmental Research and Technology (CE-CERT). Subsequent additional funding was provided by U.S. EPA, and the Bay Area AQMD has funded a related charbroiler testing project at the CE-CERT facility.

To date, screening tests have been conducted on control device configurations provided by seven manufacturers. Protocol tests were then conducted on the most promising technologies and draft test results have been received on five control device configurations. Types of devices include commercially or near-commercially available technologies, including a multi-stage filter system, an Electrostatic Precipitator (ESP), and an in-hood baffle filter. Protocol tests were also conducted on prototype designs consisting of an inertial separator/aerosol mist device and a ceramic filter with microwave regeneration. Draft test results and preliminary device cost information is presented in Table 1. The preliminary cost information is for control devices only and does not include installation or operation costs which can vary significantly based on the facility. Also, cost estimates for new facilities represent an incremental increase in costs to what traditionally would have been installed whereas a retrofit device installed at an existing facility may require a complete system overhaul including fire suppression, ventilation, and electrical components which would be expected to increase cost estimates.

TABLE 1

Draft Control Device Testing Results and Preliminary Cost Estimates

Device Type	PM Control Efficiency	Preliminary Device Cost Estimates
Electrostatic precipitator (ESP)	86%	$25,000
Multi-Stage Filter	80%	$47,000
Ceramic Filter/Microwave Regeneration	63%	$20,000
Centrifugal separator/aerosol mist nebulizer	58%	$27,000
In-Hood Baffle Filter (new – retrofit)	25%	$500 - $5,000

In addition to the above technologies, SCAQMD staff is reviewing test results from a low cost device intended to reduce emissions by preventing the generation of smoke at the source instead of removing particulates from the exhaust stream with a traditional PM control device. SCAQMD staff are also reviewing other promising technologies intended to provide low to mid-range control efficiencies at lower costs. All of the CE-CERT test results and manufacturer supplied cost data, along with previous control device testing, are being compiled and will be presented in a technical and cost

feasibility analysis intended to guide future regulation of PM emissions from under-fired charbroilers.

An additional action was approved by the SCAQMD Governing Board in 2011 to develop a companion $150,000 contract with CE-CERT to further characterize emissions from under-fired charbroilers. A draft of the report, entitled "Characterization of Under-Fired Charbroiler Emissions" has been received by SCAQMD and the report confirms that under-fired charbroiler PM emissions are primarily less than one micron in size, are dominated by organic carbon and include compounds which are known toxics, mutagens, and carcinogens. As presented in Figure 1, the CE-CERT Characterization report also documented that several of the control technologies could significantly reduce Polycyclic Aromatic Hydrocarbons (PAHs) compounds which have mutagenic and carcinogenic properties. Applicable information from the characterization study will be included in the technical and cost feasibility report.

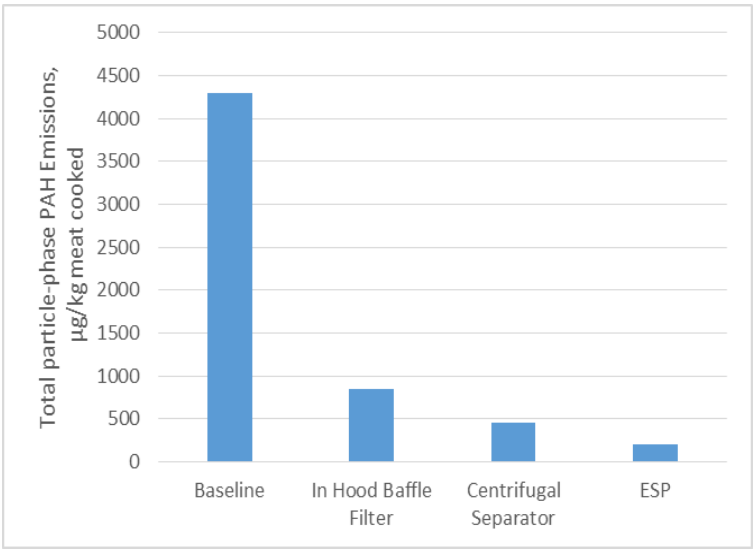

FIGURE 1
Particle-phase PAH Emissions for Baseline Test and Three Control Technologies

The San Joaquin Valley Air Pollution Control District's (SJVAPCD) strategy for meeting the federal PM2.5 NAAQS includes plans to expand their commercial charbroiling rule. Through a public rule development process, SJVAPCD plans to further reduce air pollutant emissions from under-fired charbroilers beginning in 2017. For reference, the 2012 SJVAPCD PM2.5 plan estimated a 20% reduction in PM2.5 emissions was feasible by placing requirements on restaurants with under-fired charbroilers (SJVAPCD, 2012). In anticipation of the rule development effort, the SJVAPCD Governing Board authorized $750,000 in funding to conduct a series of demonstration projects where participating restaurants will be provided funding for the full cost to purchase, install, and maintain PM control device systems over two years of operation. Participating restaurants will be allowed to keep the equipment after the demonstration period has concluded (SJVAPCD, 2015). Project funding was approved in June of 2015 and a control device has been installed in one restaurant and San Joaquin Valley APCD staff is currently negotiating agreements between other control device vendors and host restaurants with the goal of up to five demonstration sites. SCAQMD staff is reviewing the SJVAPCD demonstration project as part of the technical and cost feasibility report.

PROPOSED METHOD OF CONTROL

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 SCAQMD staff and the inter-agency working group are reviewing draft test results.

The intent of this control measure is to establish a tiered program targeting higher efficiency controls for under-fired charbroilers at large volume restaurants, with more affordable lower efficiency controls at smaller restaurants. As with existing Rule 1138 requirements, a potential future control program for under-fired charbroilers could establish control device efficiency requirements based on restaurant throughput. Control device manufacturers could submit equipment for evaluation using the under-fired charbroiler testing protocol and equipment would be certified based on test results. Applicable sources could then select the control device which met operational needs and certification standards as required by a potential future SCAQMD regulation. Similar to existing Rule 1138, efforts could also be taken to develop a control device registration program as an alternative to the SCAQMD permit process. Small business incentive programs funded by mitigation fees or other sources could also be explored to help offset initial purchase and installation costs for restaurants.

EMISSION REDUCTIONS

Requiring high activity charbroiler restaurants to install control devices with at least an 80% control efficiency has been estimated to reduce emissions by approximately 1.3 tons per day. Establishing a requirement for lower activity restaurants to install a lower efficiency (e.g., 25%) control devices has been estimated to yield an additional 1.4 tons of PM2.5 reductions per day. Taken together, the requirements for high and lower use charbroiler restaurants to install PM control devices has been estimated to reduce emissions by approximately 2.7 tons of directly emitted PM2.5 per day.

RULE COMPLIANCE AND TEST METHODS

Compliance determinations could be made through inspections aided by facility recordkeeping and equipment registrations or certifications.

The "Protocol – Determination of Particulate and Volatile Organic Compound Emissions from Restaurant Operations" is the test method currently being used for testing of charbroilers and potential control devices. The test methods are used by qualified labs to certify the emissions level of specific control systems but are not employed to test emissions at individual restaurants.

COST EFFECTIVENESS

The cost-effectiveness associated with achieving 1.3 tons per day reduction by requiring high use under-fired charbroiler restaurants to install 80% efficient control devices has been estimated at approximately $13,000 per ton PM2.5. The cost-effectiveness of requirements for lower activity restaurants to install lower efficiency

devices has been estimated to range between $10,000 and $15,000 but the low end cost effectiveness estimate is based on a new restaurant. SCAQMD staff continues to work with control device manufacturers and restaurants to quantify costs, especially for retrofit technologies. SCAQMD staff would analyze industry cost impacts as part of any potential rule development process. In addition to cost-effectiveness, given that many restaurants are small businesses, affordability will also be assessed relative to capital and installation costs, as well as ongoing operational costs.

IMPLEMENTING AGENCY

The District has the authority to regulate PM emissions from restaurant operations.

REFERENCES

Bay Area AQMD, 2007. Bay Area Air Quality Management District Staff Report, Regulation 6, Rule 2: Commercial Cooking Equipment; November 2007.

SCAQMD, 2007. South Coast Air Quality Management District Final 2007 AQMP Appendix IV-A District's Stationary and Mobile Source Control Measures; June 2007.

SCAQMD, 2009. South Coast Air Quality Management District Preliminary Draft Staff Report, Proposed Amended Rule 1138 – Control of Emission from Restaurant Operations; August 2009.

SCAQMD, 2011. South Coast Air Quality Management District Request to the Governing Board to Designate Funds and Issue Program Opportunity Notice for Testing Control Equipment for PM Reductions from Under-fired Charbroilers and Execute a Contract for Speciation and Toxicity Analysis of Emissions from Under-fired Charbroilers; October 7, 2011.

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SJVAPCD, 2015. San Joaquin Valley Air Pollution Control District Governing Board Agenda Item 7: Approve Next Steps for Addressing Emissions from Under-fired Charbroilers at Valley Restaurants; July 2015.

EMISSION REDUCTIONS FROM COOLING TOWERS [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	INDUSTRIAL COOLING TOWERS		
CONTROL METHODS:	DRIFT ELIMINATOR		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY	TBD	TBD	TBD
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

DESCRIPTION OF SOURCE CATEGORY

This control measure will seek reductions of PM emissions from industrial cooling towers through the use of the latest drift eliminator technologies. The proposed control measure will reduce PM emissions from cooling towers by requiring the use of more efficient drift eliminators that keep drift losses to less than 0.001% of the circulating water flow rate, which will also result in water conservation.

Background

According to the surveys conducted in 1988 by the SCAQMD for the development of Rule 1404 – Hexavalent Chromium Emissions from Cooling Towers, there were approximately 4,300 cooling towers operating in the South Coast Air Basin. Industrial cooling towers are widely used to remove large amounts of heat absorbed in the circulating cooling water systems at power plants, petroleum refineries, petrochemical plants, natural gas processing plants, etc. A cooling tower at a large refinery typically handles approximately 350,000 gallons of water per minute. Industrial cooling towers can be mainly classified into dry towers and wet towers.

Wet Cooling Towers

Wet cooling towers (direct or open circuit cooling tower) are enclosed structures containing a labyrinth-like packing or "fill" and are operated on the principle of latent and sensible cooling. The sensible cooling occurs as the air temperature increases by absorbing heat from the process water. The latent cooling occurs as some of the process water evaporates. As a result, hot water from the process stream is cooled as it descends through the fill while in direct contact with air that passes thru it. The cooled water is collected in a cold water basin and is recycled to absorb more heat.

The heated air leaving the fill is discharged to the atmosphere. Wet cooling towers can be further categorized as mechanical-draft and natural-draft cooling towers.

Mechanical-draft cooling towers use large fans to force or draw air through the cooling towers, and are referred to as forced or induced-draft. Mechanical forced-draft cooling towers use mounted fans from the sides to force air into the towers. The more common induced-draft towers use mounted fans at the top to draw air in through the sides and expel it through the top of the towers. The induced draft towers discharge warm air at higher velocities, resulting in better dispersion of the expelled air, minimizing re-circulation of discharged air flow back into the air intake, thus maximizing cooling towers performance.

Natural-draft cooling towers generate airflow from natural driving pressure caused by the difference in density between the outside cool air and the inside hotter, humid air. The driving pressure is a function of the outside and inside air density and the height of the cooling tower. Natural-draft cooling towers require significant height (can be in excess 500-feet height) to generate the required airflow through the tower and is less aesthetically desirable.

Dry Cooling Towers

Dry cooling towers are closed systems where circulating water does not interact with ambient air and heat rejection occurs through sensible heat transfer. Sensible heat transfer is achieved by passing the circulating water through finned tubes over which ambient air is passed. Sensible heat transfer limits the maximum attainable water outlet temperature to the local ambient dry bulb temperature.

Although dry cooling towers do not directly emit any pollutants to the atmosphere, they generate indirect emissions due to additional parasitic losses and reduced heat transfer efficiency. Parasitic losses result from 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 EPA, the installation cost of a dry cooling tower would be approximately 3.3 times that of an equivalent wet cooling tower.

Drift Issues Associated with Wet Cooling Towers

Since wet cooling towers provide direct interaction of the cooling water and the air passing through, some of the water may be entrained in the air stream and carried out of the cooling towers as drift droplets. Drift droplets contain the same minerals and chemicals as the circulating water, and can be converted to airborne emissions upon release. Drift droplets can also potentially carry bacteria such as Legionella. Inhaling airborne water droplets containing Legionella can pose significant health issues.

Large drift droplets that settle out of the exhaust air stream and deposit near the towers can cause damage to surrounding equipment and vegetation due to wetting, icing, and salt deposit. Other drift droplets evaporate before being deposited on the surrounding areas, discharging PM emissions as the drift droplets evaporate and form fine

particulate matter by crystallization of dissolved solids. The rate of PM discharged to the atmosphere depends upon the following:

- The mass fraction of Total Dissolved Solids (TDS) in circulating water;
- Drift factor which is the percentage of water that leaves as drift droplets with respect to circulating water flow rate; and
- Circulating water flow rate through the tower.

In addition to PM, heavy toxics may also be released through drift droplets. Toxic compounds may be introduced to the circulating water intentionally (as with chromium compounds for water treatment) or as a result of leakage from a process heat exchanger that handles fluid containing toxics.

Drift rates range between 0.01% and 0.0005% of the circulating water flow, for the 1970s era cooling towers to the cooling towers with advanced technology that are available currently, respectively.

Regulatory History

Cooling towers are largely exempt from permits requirement under Rule 219 – Equipment Not Requiring a Written Permit Pursuant to Regulation II, which exempts towers that are not used to cool process water by evaporation and not use chromium compounds to treat circulating water. In the past, chromium compounds were added to cooling tower water to protect equipment and piping from corrosion, and to control algae growth in the towers.

Cooling towers that have used hexavalent chromium for water treatment are subjected to Rule 1404. Rule 1404 phased-out the use of hexavalent chromium (Cr^{+6}) and limited the concentration of Cr^{+6} in circulating water to 0.15 mg/L as of 1990. The use of Cr^{+6} in cooling towers built after 1990 is prohibited in the South Coast Air Basin. However, older cooling towers could still emit chromium.

SCAQMD rules pertaining to PM mass rates and concentrations in discharged air could be applied to cooling towers (Rule 404 – Particulate Matter - Concentration and Rule 405 – Solid Particulate Matter - Weight.) However, these rules are generally ineffective for the control of PM emissions from cooling towers due to characteristically lower emission rates or concentrations.

PROPOSED METHOD OF CONTROL

Drift eliminators are usually incorporated into the design of cooling towers to limit the amount of drift droplets from the air stream before air exits the towers. Drift eliminators rely on the inertial impaction principle caused by sudden change in direction of the air stream passing through the eliminators. The momentum of the heavier water droplets causes them to separate from the air stream and impinge against

the drift eliminators. The water droplets coalesce into a film that will fall back into the towers.

Drift eliminator configurations include blade-type, wave form, and cellular designs. They can be made of ceramics, fiber reinforced cement, fiberglass, metal, plastic, and wood, formed into closely spaced slats, sheets, honeycomb assemblies, or tiles. The selected materials may include other features, such as corrugations and water removal channels to further enhance drift removal rates.

Blade drift eliminators are more durable compared to other configurations due to their heavier gauge blades. They are designed for effectively capture drift droplets in a most cost-effective manner.

In general, cellular drift eliminators provide the greatest effective surface area for maximum drift removal efficiency at minimum pressure drop. With proper installation, a cellular drift eliminator can keep drift losses to less than 0.001% of the recirculating water flow rate, resulting in water savings as well. In addition, cellular drift eliminators can be trimmed for a tightest fit, hence further improve the drift eliminator efficiency.

The proposed control measure will seek to phase-in the use of drift eliminators with 0.001% efficiency for existing cooling towers. This can be achievable by retrofitting the older cooling towers with modification to the cooling fans to accompany the drift eliminators. Newly constructed cooling towers have demonstrated ultra-low drift rate of 0.0005%. This drift rate has been achieved in practice and could be considered BACT for new construction.

EMISSION REDUCTIONS

To be determined.

RULE COMPLIANCE AND TEST METHODS

To be determined.

COST EFFECTIVENESS

To be determined.

IMPLEMENTING AGENCY

The District has the authority to regulate emissions from stationary sources such as cooling towers.

REFERENCES

1. "Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, Volume I: Stationary Point and Area Sources, Chapter 13.4 Wet Cooling Towers", United States EPA, 1995. http://www.epa.gov//tnn/chief/ap42/
2. El-Wakil, M. M.: "Powerplant Technology." McGraw-Hill Book Company, New York, 1984.
3. Reisman, Joel; Frisbie, Gordon: "Calculating Realistic PM10 Emissions from Cooling Towers", Greystone Environmental Consultants, Inc., 650 University Avenue, Suite 100, Sacramento, CA 95825.
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6. "Technical Development Document for the Final Regulations (EPA-821-R-01-036) November 2001,Chapter 4", United States EPA, 2001 http://www.epa.gov/waterscience/316b/technical/ch4.pdf
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8. "Technical Development Document for the Final Regulations (EPA-821-R-01-036) November 2001,Chapter 1", United States EPA, 2001 http://www.epa.gov/waterscience/316b/technical/ch1.pdf
9. Brentwood Industries http://www.brentwoodindustries.com/products/cooling-tower/drift-eliminators/

FURTHER EMISSION REDUCTIONS FROM PAVED ROAD DUST SOURCES [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	PAVED ROAD DUST		
CONTROL METHODS:	MINIMUM STREET SWEEPING FREQUENCY, TARGETED CLEANING OF ROADS WITH HIGH SILT LOADINGS, WHEEL WASHING SYSTEMS FOR STATIONARY SOURCES		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY	7.8	8.5	8.7
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

DESCRIPTION OF SOURCE CATEGORY

The purpose of this control measure is to reduce paved road dust emissions.

Background

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot through the re-suspension of loose material. Paved road dust emissions have been found to vary with what is termed the "silt loading" present on the road surface. Silt loading is more specifically defined as the mass of silt-sized material (> 75 micrometers in diameter) per unit area of the travel surface. Sources affecting silt loading generally include: 1) pavement wear and decomposition; 2) vehicle-related deposition; 3) dust fall; 4) litter; 5) mud and soil carryout from unpaved areas; 6) erosion from adjacent areas; 7) spills; 8) biological debris; 9) ice control compounds; 10) recent precipitation history; and 11) recent road sweeping/cleaning history. Because of the importance of silt loadings to emissions, paved road dust control techniques attempt to either prevent material from being deposited on the surface (preventative controls) or remove material deposited on travel lanes (mitigative controls). Examples of preventative controls include covering of haul trucks or paving of access areas to construction sites. Street sweeping is an example of a mitigative control. In general, preventative controls are usually more cost-effective than mitigative controls to reduce paved road dust PM emissions (U.S. EPA, 2011).

Regulatory History

In accordance with U.S. EPA guidance, SCAQMD has implemented programs to reduce paved road dust emissions through both preventative and mitigative controls. SCAQMD Rule 1157 - PM10 Emission Reductions from Aggregate and Related Operations, for example, requires access improvements which are intended to reduce the amount of material tracked out from a facility onto surrounding paved public roads. Similarly, SCAQMD Rule 403 - Fugitive Dust, requires access improvements for sites greater than five acres and all material tracked out from applicable sources must be removed at the conclusion of the work day or at any time it extends more than 25 feet out from a site. SCAQMD Rule 1186 - PM_{10} Emissions from Paved and Unpaved Roads, and Livestock Operations, includes requirements for local governments which are responsible for public paved road construction and maintenance activities. Rule 1186 requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Local governments are also required to remove material deposited onto roads as a result of wind, water erosion, or by other means, and are also required to procure only SCAQMD Rule 1186-certified street sweepers when replacing equipment.

PROPOSED METHOD OF CONTROL

Existing SCAQMD Rule 1157 and 403 requirements to reduce track out from stationary sources (e.g., aggregate facilities, construction sites, landfills, etc.) are based on a list of options. Further emission reductions could be achieved by specifying the most effective track out prevention measures, such as use of a wheel washing system, for sites with high vehicular activity exiting the site, or those with repeated track-out violations.

Existing Rule 1186 requires the procurement of Rule 1186 certified street sweepers for equipment purchases or contracts initiated after January 1, 2000. Based on information provided by local governments, street sweepers typically have a useful life of seven to ten years, and thus presumably, all street sweepers in use today by local governments are certified devices. Rule 1186 requires that certified equipment be used on public roads currently subject to routine street sweeping but does not specify frequency. Accordingly, further paved road dust PM2.5 emission reductions could be sought through specifying the frequency of street sweeping. In the San Joaquin Valley, for example, a regulation requires street sweeping at a frequency of at least once per month for roads where sweeping is conducted (SJVUAPCD Rule 8061, 2004). Street sweeping is a portion of some local jurisdiction's National Pollutant Discharge Elimination System (NPDES) permits to reduce debris from entering the storm drain system (City of Fullerton, 2015). A review of existing NPDES mandates would be conducted in conjunction with any potential future rulemaking efforts.

As part of efforts to reduce paved road dust silt loadings and the corresponding PM emissions, an evaluation of existing SCAQMD fugitive dust regulations will be conducted to determine if additional PM 2.5 emissions can be achieved.

EMISSION REDUCTIONS

Emissions in the control measure summary represent baseline PM2.5 emissions from all road classifications (e.g., freeways, collector streets, etc.) and emission reductions from a potential control program have not yet been estimated. Future emission reduction calculations will take into account any adjustments to U.S. EPA AP-42 or California Air Resources Board (CARB) emission factors.

RULE COMPLIANCE AND TEST METHODS

Compliance with this control measure can be monitored through recordkeeping and inspections. Street sweeper certification standards are presently contained in Rule 1186 and the District Test Protocol: Rule 1186 Certified Street Sweeper Compliance Testing.

COST EFFECTIVENESS

The cost effectiveness of this control measure has not been determined. The design of a wheel washing system will vary greatly depending on site-specific characteristics and anticipated traffic levels. Basic wheel washer system costs for a site with 100 trucks exiting a day have been estimated to range from $55,000 to $63,000 (approximately $12,500 for installation) and operational costs will vary with local utility rates (Neptune Company, 2015). Wheel washing systems can also be leased for approximately $3,000 per month with one time installation/removal, including transportation, costs estimated at approximately $14,000. Operational and maintenance costs will depend on site-specific conditions (Rain for Rent, 2015). Street sweeping costs vary greatly based on number of miles and frequencies and whether the work is conducted with in-house or contracted resources. One local jurisdiction estimated twice monthly contract sweeping costs at $25 per curb mile (Riverside County, 2015). SCAQMD will continue to analyze the most recent emission factors for paved road dust and will provide cost effectiveness information as it becomes available.

IMPLEMENTING AGENCY

The SCAQMD has the authority to adopt and enforce rules and regulations to reduce emissions from fugitive dust sources.

REFERENCES

City of Fullerton, 2015. Contact with Ty Richter, Street Supervisor, City of Fullerton, September 2015.

Neptune Company, 2015. Contact with Tris Waystack, National Sales Manager, Neptune Automated Wheel Wash, September 2015.

Rain for Rent, 2015. Contact with Bill Geyer, Industrial Sales Representative, Rain for Rent Company, September 2015.

Riverside County, 2015. Contact with Cathy Wampler, Riverside County Transportation Department, September 2015.

SJVAPCD, 2004. San Joaquin Valley Air Pollution Control District, Rule 8061 (Paved and Unpaved Roads), Section 5.1.2.4, August 2004.

U.S. EPA, 2011. U.S. Environmental Protection Agency, Compilation of Emission Factors (AP-42), Section 13.2.1, Paved Roads, December 2011.

EMISSION REDUCTIONS FROM MANURE MANAGEMENT STRATEGIES [NH3]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	FRESH LIVESTOCK WASTE		
CONTROL METHODS:	YEAR-ROUND OR SEASONAL/EPISODIC MANURE MANAGEMENT - ACIDIFIER APPLICATION, DIETARY MANIPULATION, FEED ADDITIVES, AND OTHERS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
NH3 INVENTORY	12.61	8.16	7.51
NH3 REDUCTION		TBD	TBD
NH3 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

DESCRIPTION OF SOURCE CATEGORY

The purpose of the control measure is to reduce ammonia emissions (a PM2.5 precursor) from livestock waste with an emphasis on dairy manure. The control measure will seek to use manure management, such as Acidifier Application, Dietary Manipulation, Feed Additives, and other manure control strategies which can be applied on a year-around basis. To minimize costs, some control techniques could be seasonally or episodically applied during times when high ambient PM2.5 levels are of concern.

Background

The South Coast Air Basin is exceeding both State and federal air quality standards for PM2.5 and is currently designated by the U.S. EPA as a serious non-attainment area for PM2.5. Ammonia contributes to formation of PM2.5 via atmospheric reactions with NOx and SOx emissions to form aerosol ammonium nitrate and ammonium sulfate. Livestock waste produces significant amounts of ammonia emissions.

In 2013, there were approximately 154,000 dairy cattle, 7.9 million poultry, and 5,500 swine in the South Coast Air Basin. In general, with existing regulation (i.e., Proposition 2 – known as cage-free proposition that passed in 2008), economics, and product demand, the livestock industry in the South Coast jurisdiction is not considered a growth industry. However, due to large amount of cow manure generated daily and with recent research findings that freshly excreted manure in the animal housing areas

is a significant source of ammonia emissions, selection of effective measures to minimize ammonia emissions from fresh manure is the focus of this control measure.

Regulatory History

Rule 1133.2 – Emission Reductions from Co-Composting Operations which was adopted in 2003 requires existing and new co-composting (including manure composting) facilities to comply with proper composting and control in order to achieve a minimum of 70% and 80% VOC reductions, respectively, with similar reductions for ammonia.

The 2007 AQMP Control Measure MCS-05 - Emission Reductions from Livestock Waste sought additional emission reductions from confined animal facilities (CAFs), beyond those achieved by current Rule 223 - Emission Reduction Permits for Large Confined Animal Facilities and Rule 1127 - Emission Reductions from Livestock Waste. Control Measure MCS-05 suggested adding control requirements for swine operations to meet the objectives of California Senate Bill (SB) 700 – Agriculture & Air Quality Summary and implementation. The control measure aimed to require more stringent controls (Class Two Mitigation Measures) for large confined animal facilities and lesser controls (Class One Mitigation Measures) for smaller confined animal facilities not currently subject to Rule 223 by bringing them into the District permit system. The control measure also aimed to further expand the scope of Rule 1127 based on anticipated results of on-going and future scientific research regarding manure management. Overall, MCS-05 estimated 20% emissions reduction from each of the dairy, poultry, and swine categories.

Currently, Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities requires a Permit to Operate for all large CAFs, which include facilities with (1): 1,000 or more milking cows; or 3,500 or more beef cattle; or 7,500 or more calves, heifers, or other cattle; or (2): 650,000 or more laying hens; or (3): 3,000 or more swine. In addition, the rule also requires these large facilities to submit and implement an emission mitigation plan developed based on different classes of mitigation measures to minimize VOC emissions from housing, feed operations, and manure handling.

Rule 1127 – Emission Reductions from Livestock Waste requires best management practices for dairies, and specific requirements regarding manure removal, handling, and composting; however, the rule does not focus on fresh manure, which is one of the largest dairy sources of ammonia emissions.

In 2011, staff conducted a Technology Assessment that included a revised emissions inventory for all pollutants, including ammonia, to reflect new emission factors as well as current and future livestock animal headcounts. Based on the revised emissions inventory, industry-level projections (i.e., mostly negative growth), and current regulatory requirements, Rule 1127 amendments were not pursued at that time.

The 2012 AQMP Control Measure BCM-04 – Further Ammonia Reductions from Livestock Waste sought ammonia emission reductions from cow manure though

seasonal or episodic application of the acidifier sodium bisulfate (SBS). The control measure also suggested a two-stage implementation. Phase I would include a technical assessment of the aforementioned method of control. If deemed feasible and effective, Phase II would implement the measure as needed to address future PM2.5 standards. Rule requirements would be specific to dairies in the AQMD jurisdiction and may be unique to localized operations only. SBS application will continue to be included in this control measure.

PROPOSED METHOD OF CONTROL

The following are new approaches aiming to reduce ammonia emissions from manure and through modification of the animal food intake.

Acidifier Application

Reducing the pH level in manure through the application of acidifiers is one of the potential mitigation strategies for ammonia. SBS is being considered for use in animal housing areas where high concentrations of fresh manure are located. Research indicates best results with the use of SBS on hot spots. SBS can also be applied to manure stock piles and at fencelines, and upon scraping manure to reduce ammonia spiking from the leftover remnants of manure and urine. In California, it has been used by dairies in Tulare, Fresno, Merced, Stanislaus, San Joaquin, Kings, Kern, San Bernardino, Riverside, San Benito, and Sacramento, mainly to prevent cow lameness and nuisance flies. It has also been used by dairies in Walla Walla, Columbia, and Whitman (Washington), Wallowa (Oregon), and Wisconsin.

The emission reductions associated with SBS application are unknown at this time. Based on historical data, application may only be required for eight weeks out of the year; hence, seasonal or episodic application of SBS may be effective during times when high ambient PM2.5 levels are of concern.

Research indicates emission reduction potential in the range of 60%; however, SBS application timing and manure coverage variables require further consideration. Existing information regarding SBS application at dairies in the South Coast Air Basin indicates an overall emission reduction potential of about 50%. Current use of SBS and application coverage volume and rates, along with cost, will be examined in conjunction with the above referenced Phase I pilot program and assessment.

Dietary Manipulation

Dietary manipulation such as lowering the protein content and including high-fiber ingredients is an effective method to decrease ammonia emissions from monogastric animals and ruminants manure. Experiments found up to 76% ammonia emissions reduction in manure of dairy cows fed with reduced protein diet. For swine, with the addition of amino acid supplement, lowering crude protein content by 3% would decrease nitrogen excretion by approximately 30% and ammonium concentration of the slurry by 37%. The decrease in nitrogen excretion reduces the concentration of ammonium, which in turn decreases ammonia emissions. In addition, the reduction in ammonium concentration also lowers the slurry pH which affects ammonia

volatilization. Lower ammonia emissions are also found in manure of laying-hen fed low-protein and high-fiber diet (i.e., DDGS, a corn distiller's dried grains with solubles, or EcoCalTM, a mixture of calcium sulfate and zeolite). Research indicates that lowering 1% of crude protein diet results in a 10% decrease in ammonia emission from laying hens in high-rise houses while egg production is not compromised. Manure of hens fed with 10% DDGS is found to emit 40% less ammonia. Dietary manipulation can also be considered for household pets.

Feed Additives

Research indicates that for each 1% increase in fermented carbohydrates, such as bran and pulp, added into growing-finishing diets, a 14% ammonia emission reduction would occur. The reduction may be due to a pH effect or a shift of urinary to fecal nitrogen excretion.

Additives that either bind ammonia or inhibit urease (an enzyme that breaks down to ammonia) also showed reductions in ammonia emission (26 percent over a seven-week period in swine fed yucca extract).

The use of amino acid and enzyme supplements can reduce nitrogen excretion up to 40%, which in turn, reduces ammonia emissions. Feed additives can be considered as a seasonal or episodic control strategy when ambient PM2.5 concentrations are highest.

In addition, the following are new approaches aiming to reduce ammonia emissions from manure.

Manure Slurry Injection

Manure slurry injection would provide a significant (greater than 90%) reduction in odor and ammonia emissions compared to conventional land spreading. Manure injection would require approximately four to five times less fresh air dilutions than land spreading to reach the odor threshold. However, potential soil salinity and groundwater contamination must be carefully examined.

Conventional tillage and no-till injection systems are available for slurry and liquid manure. Currently, the injection systems are not commercially available for solid manures. Manure injection might disturb the soil or crop root system (forages, pasture/sod) and is more costly due to higher tractor horsepower and additional equipment maintenance. Cost increases as application rate decreases and distance from the manure storage site increases. At a 5,500 gallons per acre application rate, commercial drag hose injection cost is currently $0.014/gal compared to $0.0085/gal for land spreading. Manure injection can be considered as a seasonal or episodic control strategy.

Microbial Manure Additives

The use of bacterial products (Bacillus based) has demonstrated to effectively reduce ammonia emissions in broiler, layer, and turkey manure by lowering the gram negative bacterial population. Gram negative bacteria break down nitrogen in uric acid and

convert it to ammonia emissions. Typical treatment costs are $0.005 per broiler, $0.055 per 40-lb turkey, and $0.028 per 16-lb hen, and $2.0 per ton of feed for layers.

Manure Belt Cleaning In Laying Hen House

Increasing manure belt cleaning frequency in laying hen house from once every four days to once every two days has the potential to reduce ammonia emissions by 45%. More frequent cleaning should be conducted when ambient PM2.5 concentrations are highest in the region.

Cage-Free Egg Laying Manure Removal

Cage-free egg laying hens produce eggs as well as manure in their living areas. Manure in the barns needs to be removed preferably on a daily basis to reduce ammonia emissions and minimize dust particles containing pathogens and toxins. The Aviary system where cage-free chicken can move up and down several levels and manure belt collects the falling dirt and manure is one of the many options available commercially. Manure belts of this system should be cleaned at least once every two days.

Poultry Manure Thermal Gasification

An emerging approach to manure management involves thermal gasification, whereby, after approximately 20 percent moisture content is removed, egg-laying manure is fed into a thermal gasifier where remaining moisture is evaporated, organic solids are converted into syngas, and mineral-rich ash is produced. Combustion gases from the process are treated by a bag filtration system before being released into the atmosphere. Syngas is ducted to a thermal oxidizer for heat generation. Ash byproduct is used as an animal feed supplement.

For example, by processing 240 tons of poultry manure daily from 5 million egg layers, the $30 million thermal gasifier plant in Pennsylvania is anticipated to reduce approximately 50 percent of ammonia emission and over 34,000 tons of carbon dioxide-equivalent greenhouse gases annually in addition to other benefits, such as biomass energy and mineral production.

EMISSION REDUCTIONS

To be determined.

RULE COMPLIANCE AND TEST METHODS

To be determined.

COST EFFECTIVENESS

To be determined.

IMPLEMENTING AGENCY

The District has the authority to regulate emissions from livestock waste.

REFERENCES

Rule 1133.2 – Emission Reductions from Co-Composting Operations, SCAQMD, January 2003

Rule 1127 – Emission Reductions from Livestock Waste, SCAQMD, August 2004

Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities, SCAQMD, June 2006

2007 Air Quality Management Plan, Appendix IV-A, Control Measure MCS-05 – Emission Reductions from Livestock Waste, SCAQMD, June 2007

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Contact with Mr. Chris O'Brien of Jones-Hamilton Co.

Contact with Mr. Edward Kashak of California Regional Water Quality Control Board, Santa Ana

AMMONIA EMISSION REDUCTIONS FROM NOX CONTROLS [NH3]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	VARIOUS NOX SOURCES		
CONTROL METHODS:	AMMONIA SLIP CATALYSTS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
NH3 INVENTORY	TBD	TBD	TBD
NH3 REDUCTION		TBD	TBD
NH3 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

DESCRIPTION OF SOURCE CATEGORY

The purpose of this control measure is to seek reductions of ammonia from NOx controls such as Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR).

Background

Ammonia slip results from of the injection of ammonia into the flue gas stream of combustion equipment such as boilers, engines, furnaces, and turbines that utilize either Selective Catalytic Reduction (SCR) or Selective Non-Catalytic Reduction (SNCR). Ammonia (or urea) is used in these control systems to react with NOx for conversion into nitrogen gas (N_2) and water (H_2O). These systems are capable of reducing NOx emissions from combustion sources very effectively. However, the use of these systems also results in potential emissions of ammonia that "slip" past the control equipment and into the atmosphere.

Ammonia molecules react with NOx molecules at a 1:1 stoichiometric ratio. NOx reductions are readily achievable if excess ammonia is used. However, ammonia is a precursor for particulate matter. SCR & SNCR systems include balancing and feedback loops to prevent too much or too little ammonia from being injected, while maintaining a sufficiently fast response time for any load changes.

Regulatory History

SCAQMD Rule 1105.1 – Reduction of PM10 and Ammonia Emissions from Fluid Catalytic Cracking Units which applies to fluid catalytic cracking units at petroleum refineries, contains an ammonia slip limit of 10 ppmv corrected to 3% O_2 dry, averaged over 60 consecutive minutes. Although there are no other source specific

rules for ammonia emissions resulting from the use of add-on controls for combustion equipment, there are limits set forth in the SCAQMD's Best Available Control Technology (BACT) guidelines for non-major polluting facilities. Ammonia slip emissions for gas turbines and IC engines with add-on controls are less than or equal to 10 ppm for smaller units and 5 ppm for larger units (corrected to 15% O_2). For boilers and process heaters, the ammonia slip limits are 5 ppm (corrected to 3% O_2).

PROPOSED METHOD OF CONTROL

Recent advances in catalyst technology have resulted in the development of ammonia slip catalysts that selectively convert ammonia into nitrogen (N_2). These catalysts could be installed post-SCR and would result in less ammonia slip.

EMISSION REDUCTIONS

Ammonia slip catalysts can generally achieve at least a 75% ammonia reduction, which can vary based on process parameters. Potential emission reductions based on the ammonia slip inventory are yet to be determined.

RULE COMPLIANCE AND TEST METHODS

SCAQMD Method 207-1, *Determination of Ammonia Emissions from Stationary Sources,* or any alternative or equivalent test method approved by the Executive Officer, CARB, and EPA.

COST EFFECTIVENESS

To be determined.

IMPLEMENTING AGENCY

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

REFERENCES

1. *SCR and Advanced Ammonia Slip Catalyst*, Johnson Matthey Presentation, SCAQMD 2016 AQMP Control Strategy Symposium, June 2015.
2. Gil, Elena. *Evaluation of Ammonia Slip Catalysts*, Department of and Chemical Biological Engineering, Chalmers University of Technology, Göteburg, Sweden, 2013.

EMISSION REDUCTIONS FROM ABRASIVE BLASTING OPERATIONS [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	ABRASIVE BLASTING		
CONTROL METHODS:	DUST COLLECTION WITH AIR FILTRATION		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY*	0.006	0.006	0.007
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

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

DESCRIPTION OF SOURCE CATEGORY

Abrasive blasting is the cleaning, preparing or texturizing of the surface of a material such as metal or masonry by forcibly propelling a stream of abrasive material against the surface. Sand is the most widely used blasting abrasive. Other abrasive materials include slag, steel or iron shot/grit, garnet or walnut shells. Abrasive blasting operations are done in both confined and unconfined conditions.

Background

Abrasive blasting includes both permitted and non-permitted sources. Based on the preliminary permit record, SCAQMD received a total of 243 permit applications for abrasive blasting operations since 1991. There are 84 active permits received from 57 facilities within the SCAQMD jurisdiction. Out of the active permits, 68 permits are for cabinet/machine/room abrasive blasting and the remaining 16 permits are for portable/open abrasive blasting. More than one half of the active permits are from manufacturing industry establishments. Because some abrasive blasting equipment are exempt from a written permit according to Rule 219, the total universe of abrasive blasting operations is expected to be much broader than the permit record.

Regulatory History

SCAQMD Rule 1140 – Abrasive Blasting was first adopted in February 1980 and then amended in 1985 to conform to the California Code of Regulations (CCR) Title 17,

Subchapter 6 – Abrasive Blasting. The CCR and Rule 1140 establish both operating requirements and abrasive materials requirements. These regulations establish prohibition against visible emissions in the Ringelmann scales or percentages of opacity from confined or unconfined abrasive blasting operations. Abrasive blasting operations are also subject to the no visible emissions requirements in the SCAQMD Rule 1155 – Particulate Matter (PM) Control Devices, for operations used in conjunction with a PM air pollution control device. This control measure would seek amendments to existing Rule 1140.

PROPOSED METHOD OF CONTROL

Current permit conditions for abrasive blasting in confined (cabinet/machine/room) conditions require venting to a PM air pollution control (APC) equipment when in full use. Baghouses or dry filters are the most frequently used APC equipment. For open and portable blasting operations, venting to APC equipment is not required unless abrasives contain a carcinogenic toxic material. This control measure proposes the following methods of control, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment with or without a written SCAQMD permit:

- Blasting Enclosures and Dust Collection
    - A portable blasting enclosure/booth can be installed at the outdoor job site with a dust collection system. The portable enclosure is proposed for outdoor blasting even when abrasives used do not contain any known carcinogenic toxic material. The blasting emissions are then vented to PM APC equipment with a combination of filters installed. If abrasives contain a known carcinogenic material, a manufacturer-certified HEPA filter should be used in the APC equipment.
    - The outdoor workspace may be walled off with permanent or temporary construction barriers while maintaining a negative pressure environment.
    - The pressure conditions may need to be monitored to ensure the proper pressure is maintained so that blasting dust would not escape out of the enclosed workspace. Portable or fixed differential pressure monitors may be considered to continuously monitor and document pressure conditions.

EMISSION REDUCTIONS

The universe of PM emissions and emission reductions will be investigated as part of rule development. Once dust is collected into a collection system, cartridge-type dust collectors can achieve up to 99.9% efficiency on 0.2-2 µm particles, if well maintained. A HEPA filter is generally certified by manufacturers to remove PM down to a size of 0.3 µm with 99.97% efficiency. Dust collection efficiency of these systems can vary based on the operation and equipment type.

RULE COMPLIANCE AND TEST METHODS

All abrasives used for dry unconfined blasting should be tested in accordance with "Method of Test for Abrasive Media Evaluation, Test Method No. Calif. 371-A", or other test method approved by the Executive Officer.

COST EFFECTIVENESS

Cost-effectiveness will be determined during rule development.

IMPLEMENTING AGENCY

The District has the authority to regulate emissions from both permitted and non-permitted blasting operations.

REFERENCES

1. SCAQMD, Rule 1140 – Abrasive Blasting, Amended August 2, 1985.

2. SCAQMD, Rule 1155 – Particulate Matter (PM) Control Devices, Amended May 2, 2014.

3. California Code of Regulations, Title 17 Subchapter 6 – Abrasive Blasting (Sections 92000-92530).

4. DOE, Specifications for HEPA filters used by DOE contractors, U.S. Department of Energy, DOE-STD-3020-2005, December 2005.

EMISSION REDUCTIONS FROM STONE GRINDING, CUTTING AND POLISHING OPERATIONS [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	STONE FABRICATION OPERATIONS		
CONTROL METHODS:	WET DUST SUPPRESSION, PORTABLE DUST COLLECTOR WITH HEPA FILTER		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY*	0.013	0.017	0.017
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

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

DESCRIPTION OF SOURCE CATEGORY

Stone fabrication such as grinding, cutting, drilling, scarifying, polishing, carving, and etching generates significant amounts of dust emissions containing PM10, some PM2.5, and silica particles which are known to cause lung diseases or silicosis. Uncontrolled PM emissions from stone work can contribute to regional PM levels, can cause high concentrations of PM locally, while also elevating the exposure of workers and neighborhood residents to toxic silica particles.

Background

Masonry or building materials such as concrete, stone, granite, tile, brick, and mortar can be processed for a variety of purposes at confined (e.g., stone shops) or unconfined (outdoor) worksites. Examples of these processes include, but are not limited to, grinding, milling, cutting, scarifying, drilling, carving, etching, and polishing operations for residential and commercial new construction and renovation. Many of those operations are performed by builders, landscapers and remodeling contractors, and may not be properly controlled for dust emissions. These operations are most likely to be exempt from requiring a permit under Rule 219.

Regulatory History

SCAQMD Rule 219 does not require permits from machining equipment exclusively used for polishing, cutting, surface grinding, etc. However, SCAQMD

Rule 403 – Fugitive Emissions, prohibits fugitive emissions from any onsite mechanical activities, including cutting, from exceeding a 20% opacity limit.

PROPOSED METHOD OF CONTROL

This control measure would seek to control particulate matter (PM) including silica particles. Both dry and wet dust control options are available. Some of these methods of control are already regulated by the California Occupational Safety and Health Administration (Cal/OSHA) as existing work place standards.

- Wet Control Methods: wet systems involve spraying water onto the rotating cutting disc to reduce dust emissions. Emissions are expected to be minimal, provided the waste material is disposed of properly. This method will produce a wet slurry associated with the wet dust suppression, in which case wet vacuuming, wet wiping, and wet sweeping can be implemented as housekeeping measures.

- Dry Control Methods:

    - Local exhaust ventilation (LEV) would be suitable for hand-held power tools (e.g., cut-off saws and grinders). It uses guards and directors attached to the tools to act as a dust collecting hood. The guard or director is connected to an industrial vacuum cleaner which provides sufficient exhaust ventilation to capture the majority of dust emitted during the cutting or grinding operation. The vacuum cleaner is equipped with high efficiency particulate air (HEPA) filter to protect workers from silica dust.

    - Dry cutting emissions can be controlled at the point of operation using a portable dust collector, air scrubber and negative air machine to prevent dust from being released into the atmosphere. A combination of a variety of filter media can be customized to achieve appropriate controls, including HEPA filters.

- Incentives: financial incentives can be made available to exchange existing dry/wet equipment with new equipment that includes integrated add-on controls.

EMISSION REDUCTIONS

HEPA filters are certified by manufacturers to be 99.97% 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. An SCAQMD rule, other enforceable instrument, or use of equipment certification or incentives will be considered. The most efficient regulatory approaches will be selected considering cost-effectiveness.

COST EFFECTIVENESS

Cost-effectiveness for proposed methods of control will be determined during rule development.

IMPLEMENTING AGENCY

SCAQMD has the authority to regulate emissions from non-vehicular sources.

REFERENCES

1. Occupational Safety and Health Administration, Hazards of Operating Unguarded Stone Cutters and Splitters in Landscaping and Other Worksites, Safety and Health Information Bulletin, SHIB 01-25-2013 (online accessed in September 2015).

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

FURTHER EMISSION REDUCTIONS FROM AGRICULTURAL, PRESCRIBED, AND TRAINING BURNING [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	OPEN BURNING		
CONTROL METHODS:	INCENTIVIZE BURN ALTERNATIVES, BURN PROHIBITIONS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY	0.34	0.68	0.68
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

DESCRIPTION OF SOURCE CATEGORY

This control measure proposes to further reduce PM emissions from open burning sources.

Background

Agricultural burning involves collection and combustion of vegetative materials produced from the growing and harvesting of crops. Prescribed burning is the planned burning of vegetative materials, usually conducted by a fire protection agency or the department of forestry in order to control plant disease and pests or to reduce fire episode impacts. Training burns are hands-on activities conducted by fire protection agencies to practice suppressing fires. Based on 2015 burn permit acreage data, over 90% of agricultural burns are conducted within the Coachella Valley area (Salton Sea Air Basin) but a limited amount of agricultural burning continues within the western Riverside/San Bernardino County portions of the South Coast Air Basin. Prescribed burns occur on the northern and eastern boundaries of the South Coast Air Basin and are sometimes incorporated into fire suppression activities. Training burns occur throughout the region. The emissions estimates shown in the table above are all of the year's open burning emissions divided by 365 days and represent annual average day emissions. Open burning emissions estimates presented on a 24-hour (daily) basis, which could include individual agricultural and prescribed burns, would be higher.

Regulatory History

Open burning activities are currently subject to SCAQMD Rule 444 – Open Burning provisions which are intended to minimize PM emissions and smoke in a manner that is

consistent with State and federal laws. Under the program, open burning is allowed on a permissive burn day, provided that a permit and an event authorization is obtained, and that such burning event is not prohibited by a fire protection agency. A permissive burn day is declared by SCAQMD when certain meteorological conditions are met. Rule 444 also includes general requirements (i.e., burning time window and ignition device) for open burning, as well as additional requirements, such as moisture level and firing methods for agricultural burning. A Smoke Management Plan is required for prescribed burning. In addition, Rule 444 sets District-wide maximum daily burn acreage for agricultural and prescribed burning, but allows for training burns if the duration is less than 30 minutes and clean fuel is utilized.

In 2013, Rule 444 was amended to align burn prohibitions with the SCAQMD Rule 445 – Wood-Burning Devices requirements during the winter season. As a result, Rule 444 now limits open burning whenever a mandatory winter burning curtailment is called under Rule 445 for individual source/receptor areas or the entire Basin. These revised provisions do not apply to open burning sources above 3,000 feet in elevation (SCAQMD, 2013).

PROPOSED METHOD OF CONTROL

Further PM emission reductions could be achieved through use of a fee schedule and/or an incentive program to limit agricultural burning and promote burning alternatives (e.g., chipping/grinding or composting). For example, under current program requirements, agricultural producers greater than 10 acres are charged approximately $150 for a burn permit and smaller sites pay no fees. One approach to reduce emissions could involve establishing a fee as part of the burn permit program based on acreage or amount of material burned and fees would not be charged to producers using burning alternatives. Another approach could involve providing incentives to agricultural producers, especially in peak PM2.5 areas, to implement alternatives to burning. A demonstration project could also be established where a SCAQMD contractor could be utilized to conduct chipping/grinding and removal activities in peak PM2.5 areas at no cost to producers.

Rule 444 was amended in 2013 to align no burn prohibitions with Rule 445 no burn day requirements during the months of November through the end of February. As described in Control Measure BCM-09, the PM2.5 threshold used to forecast no burn days under Rule 445 could be lowered or the winter season could be potentially expanded to also include October and/or March. Realigning Rule 444 burn prohibitions with any potential changes to the Rule 445 no burn day provisions could further reduce open burning emissions during peak PM2.5 episodes.

Approximately 90% of agricultural burning occurs outside of the South Coast Air Basin. If necessary to maintain PM2.5 attainment in the Salton Sea Air Basin or in response to a public concerns, Rule 444 provisions applicable to the South Coast Air Basin could be extended to Salton Sea Air Basin sources. Additionally, the current prohibition of open burning within 1,000 feet of a sensitive receptor could be applied to the burning of currently exempted plant materials, such as Russian Thistle (tumbleweeds).

EMISSION REDUCTIONS

The emissions in the control measure summary represent baseline annual average day emissions from agricultural burning. The emissions reductions from this control measure have not been estimated. For reference, a report to the San Joaquin Valley APCD Governing Board estimated a net PM2.5 reduction of approximately seven pounds per acre when shredding and land application of material was utilized instead of open burning (SJVAPCD, 2010).

If Rule 444 provisions were realigned to match potential changes to Rule 445 under BCM-09, there likely would be a slight increase in the number of no-burn days under Rule 444, however, no annual emissions reductions would be anticipated as the burning prohibited during a revised program would likely be switched to other, non-episodic times of the year.

RULE COMPLIANCE AND TEST METHODS

Rule compliance could be achieved through recordkeeping and inspections.

COST EFFECTIVENESS

The cost effectiveness of this control measure has not been estimated but costs to implement burning alternatives would be expected to be higher due to equipment and labor costs. The San Joaquin Valley APCD report on alternatives to agricultural burning estimated shredding and land application of vineyard material for a 20 acre site at approximately $975 per acre while open burning was estimated to cost approximately $200 per acre (SJVAPCD, 2010).

Cost impacts from an increase in burning prohibitions due to elevated PM2.5 levels are expected to be minimal as burning would likely be switched to other times of the year.

IMPLEMENTING AGENCY

The SCAQMD has the authority to regulate emissions from open burning sources.

REFERENCES

California Code of Regulations, Title 17 – Agricultural Burning Guidelines.

SCAQMD, 2013. South Coast Air Quality Management District, Final Staff Report Rule 444 – Open Burning, May 2013.

SJVAPCD, 2010. San Joaquin Valley Air Pollution Control District, Final Staff Report and Recommendations on Agricultural Burning, July 2010.

FURTHER EMISSION REDUCTIONS FROM WOOD-BURNING FIREPLACES AND WOOD STOVES [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	RESIDENTIAL WOOD COMBUSTION		
CONTROL METHODS:	MANDATORY CURTAILMENTS, INCENTIVE PROGRAMS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	**2012**	**2021**	**2025**
PM2.5 INVENTORY	5.2	4.9	4.9
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TBD		
IMPLEMENTING AGENCY:	SCAQMD		

DESCRIPTION OF SOURCE CATEGORY

The purpose of this control measure is to seek an additional reduction in emissions 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 (U.S. EPA, 1996a and b).

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 (Naeher, 2007). 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.

In 2011 the California Air Resources Board (CARB) conducted a Statewide evaluation

of emissions from residential wood combustion based on the most recent emission factors, activity data, and data from the American Housing Survey, U.S. Census Bureau where available (CARB, 2011). The results of the updated residential wood combustion emissions inventory, including reductions from existing control programs, are provided in the emissions summary which represents all of the emissions occurring within the year expressed in terms of an annual average day. Average winter day emissions would be higher as it is estimated that 90% of residential wood burning occurs in the months from October through the end of March.

Regulatory History

Control Measures for residential wood combustion were included in the 2007 and 2012 AQMPs and Rule 445 was adopted in 2008 and amended in 2013 to implement those control measures. Under the Rule 445 provisions, only gaseous-fueled hearth devices are allowed in new developments. For additions or modifications to existing developments, Rule 445 allows any gaseous-fueled device but any wood-burning devices sold or installed must be U.S. EPA Phase II-certified or equivalent. Rule 445 prohibits the burning of any product not intended for use as a fuel (e.g., trash) in a wood burning device and requires commercial firewood facilities to only sell seasoned firewood (20% 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 $\mu g/m^3$. These no burn provisions apply to the entire South Coast Air Basin whenever a PM2.5 level of greater than 30 $\mu g/m^3$ is forecast for any monitoring station which has recorded violations of the federal 24-hour PM2.5 standard in either of the previous two years. Lastly, Rule 445 requires commercial firewood or other wood- based fuel sellers to notify the public of the Check Before You Burn wood burning curtailment program through a labeling program (SCAQMD, 2013).

PROPOSED METHOD OF CONTROL

Wood smoke reduction programs have been implemented in this area since 2008 and in other jurisdictions for many years. The stringency of each air district's program depends on the region's PM air quality and the relative contribution of fine particulates from this source category. While it is acknowledged that the South Coast Basin has some of the highest ambient PM concentrations in the nation, speciated air quality data indicates that the contribution of residential wood smoke to regional particulate pollution is less than <10%. However, given that residential wood burning is one of the last uncontrolled sources of direct PM2.5 emissions, curtailment programs can be very cost-effective relative to other source categories.

In 2014, the San Joaquin Valley Air Pollution Control District (SJVAPCD) amended Rule 4901 and the threshold used to forecast no burn days was reduced to 20 $\mu g/m^3$ (SJVAPCD, 2014). The Bay Area Air Quality Management District (BAAQMD) is currently in the process of reevaluating the Regulation 6, Rule 3: Wood Burning Device regulation. The original BAAQMD proposal would have required multiple day burn prohibitions to prevent

smoke accumulation leading to exceedance of the federal NAAQS but this proposal has been removed as the current rule has been determined to provide the agency enough flexibility to declare consecutive no burn days in anticipation of a possible exceedance (BAAQMD, 2015). SCAQMD is evaluating the BAAQMD proposal which also includes amendments to clarify existing exemption provisions.

Based on a review of U.S. EPA guidance documents and other air district wood smoke control programs the existing SCAQMD curtailment program threshold could be lowered but a preliminary review of air quality data indicates establishing a 20 $\mu g/m^3$ threshold, as was done in the San Joaquin Valley, would virtually prohibit residential wood burning during the winter. A lower curtailment criteria (e.g., 25 $\mu g/m^3$) could be established for this area which would increase the number of no burn days but not completely prohibit wood burning during the winter. Another control option could be to utilize a similar approach as Bay Area AQMD and forecast more consecutive no burn days. The Check Before You Burn program could also be extended to also include the months of October and/or March as high PM2.5 levels can occur during these periods. All of these potential control options would increase the number of no burn days which could lower the contribution of wood smoke to ambient PM2.5 levels in the winter months. Although these episodic reductions are designed to address 24-hour PM2.5 concentrations, a consistent reduction in wintertime PM2.5 from reduced wood burning could have an impact on annual average PM2.5 concentrations. Further analysis will be conducted to determine the appropriate approach to achieve the emissions reductions necessary to demonstrate attainment of both the 24-hour and annual average federal PM2.5 NAAQS.

Since 2008, SCAQMD has implemented programs which provide financial incentives to encourage the public to switch to cleaner hearth devices. The current program encourages households within inland (high PM2.5 areas) to upgrade wood-burning devices through SCAQMD incentives of up to $1,600 to offset purchase and installation costs. Although this program has been effective, additional reductions may be achieved through the use of higher incentives or expansion of the eligible geographic area. Experience has shown that education and outreach to targeted households is vital to ensure program participation, and an additional element of this control measure would focus on expanding the effectiveness of incentive programs.

EMISSION REDUCTIONS

The emission reductions from this control measure have not been estimated but previous control measures and Rule development efforts have estimated emission reductions from the mandatory wood burning curtailment program. It should be noted that while controlling emission from residential wood burning is primarily intended to reduce PM2.5 emissions, an added benefit is reduced emissions of CO, VOC, NOx, SOx, and hazardous air pollutants.

RULE COMPLIANCE AND TEST METHODS

Compliance with this control measure is reliant on use of incentives and verification through complaint response. U.S. EPA is responsible for certifying wood burning devices under Title 40 Code of Federal Regulations, Part 60, Subpart AAA.

COST EFFECTIVENESS

The cost effectiveness of this control measure has not been determined, however, increasing the number on curtailment days would result in relatively few cost increases to the impacted community.

Based on results of the current and former SCAQMD incentive programs, a basic gas log set can be purchased at a local retailer and installed by a contractor into a home with an existing wood burning fireplace plumbed for natural gas for approximately $400 to $500. Average cost associated with removal and replacement of conventional (uncertified) wood heater with a U.S. EPA Phase II-certified device has been estimated at $3,565 per unit (MARAMA, 2006).

IMPLEMENTING AGENCY

The SCAQMD has the authority to regulate emissions from residential wood combustion sources.

REFERENCES

BAAQMD, 2015. Bay Area Air Quality Management District, Air District Proposed Amendments to Regulation 6, Rule 3: Wood Burning Devices, August 17, 2015.

CARB, 2011. California Air Resources Board; Area Source Methodology, Section 7.1 Residential Wood Combustion; March 2011.

MARAMA, 2006. Mid-Atlantic Regional Air Management Association, Task 5 Technical Memorandum 3 (Cost Benefit Analysis), Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region; October 3, 2006.

Naeher, 2007. Woodsmoke Health Effects: A Review, Journal of Inhalation Toxicology, 19:67-107, 2007

SJVAPCD, 2014. San Joaquin Valley Air Pollution Control District, Rule 4901 – Wood Burning Fireplaces and Wood Burning Heaters; Amended September 18, 2014.

SCAQMD, 2013. South Coast Air Quality Management District; Draft Final Staff Report for Proposed Rule 445 – Wood Burning Devices; May 2013.

U.S. EPA, 1996a. U.S. Environmental Protection Agency AP-42, Section 1.9, Residential Fireplaces; October 1996.

U.S. EPA, 1996b. U.S. Environmental Protection Agency AP-42, Section 1.10, Residential Wood Stoves; October 1996.

APPLICATION OF ALL FEASIBLE MEASURES [ALL POLLUTANTS]

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

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

DESCRIPTION OF SOURCE CATEGORY

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

Background

This control measure serves as a placeholder for any future control measures that may become feasible, prior to subsequent State Implementation Plan (SIP) revisions, through technology advances and/or cost decreases. The SCAQMD staff continually monitors evolving control technologies, price changes, and the actions of other air quality agencies to determine the feasibility of implementing additional controls to achieve emissions reductions. For example, almost all processes (pulping machines, press and dryers to convert waste-paper (newspaper, cardboard, etc.) back into cardboard paper) in the pulp and recycled paper mills are sources of fugitive VOC emissions, yet currently there is no known feasible control potentially available for fugitive VOC emissions generated by these type of sources. Very high air flow of vent gases makes it impractical and not cost-effective to vent the exhaust gas to a control device. Similarly, breweries, wineries, distillers and other similar operations that store and process grains, ferment, age, store and package the spirits (beer, wine, whiskey, etc.,) and treat the wastewater on site generate VOC and PM emissions. Known feasible methods of control are not cost effective based on the current emissions inventory. However, in the future, industry growth and affordable cost effective control could make these sources viable future control measures.

Regulatory History

The California Clean Air Act (CCAA) requires air districts to achieve and maintain state standards by the earliest practicable date and for extreme non-attainment areas, to include all feasible measures Health and Safety (H&S) Code (H&S §§40913, 40914, and 40920.5). While this statute is not applicable to PM, the federal Clean Air Act requires attainment of the NAAQS as early as "practicable" and, as a serious non-attainment area for PM2.5, implementation of Best Available Control Measures (BACM). The term "feasible" is defined in the 14 California Code of Regulations, section 15364, as a measure "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors." CARB guidance states that this definition, found in the CEQA Guidelines, applies to the requirements under air pollution laws. The required use of BARCT for existing stationary sources is one of the specified feasible measures. H&S Code §40440 (b)(1) requires the SCAQMD to adopt rules requiring best available retrofit control technology for existing sources. H&S Code §40406 specifically defines BARCT as "…best available retrofit technology means an emission limitation that is based on the maximum degree of reduction achievable taking into account environmental, energy, and economic impacts by each class or category of source."

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

PROPOSED METHOD OF CONTROL

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

EMISSION REDUCTIONS

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

RULE COMPLIANCE AND TEST METHODS

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

COST EFFECTIVENESS

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

IMPLEMENTING AGENCY

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

REFERENCES

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

14 California Code of Regulations, Section 15364