SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Staff Report
Proposed Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens

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INTRODUCTION

The purpose of Proposed Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (PR 1153.1) is to limit emissions of nitrogen oxides (NOx) and carbon monoxide (CO) from the combustion of gaseous and liquid fuels in food ovens, dry roasters and smokehouses. This equipment is currently regulated by SCAQMD Rule 1147 – NOx Reductions from Miscellaneous Sources and Regulation XIII – New Source Review (NSR). Rule 1147 limits emissions of NOx from gaseous and liquid fuel fired combustion equipment that are not specifically addressed in other SCAQMD Regulation XI – Source Specific Standards. However, because control technologies have not matured in a timely manner for commercial food ovens, it was decided to regulate these sources separately from the other Rule 1147 sources. In this way the commercial food ovens could be placed on a more suitable compliance schedule with achievable emission limitations.

The equipment addressed by Rule 1147 is used in a variety of industrial and commercial applications. Based on stakeholder input and further evaluation of the technical feasibility of retrofit technologies applicable to older units of this class of equipment, staff has proposed to move food ovens, including roasters and smokehouses, from Rule 1147 and place them in a proposed new rule with different emission limits and compliance dates.

REGULATORY HISTORY

The equipment proposed to be regulated by PR 1153.1 is currently regulated under SCAQMD Rule 1147. Rule 1147 is based on two control measures from the South Coast Air Quality Management District 2007 Air Quality Management Plan (AQMP): Control Measure MCS-01 – Facility Modernization and Control Measure CMB-01 – NOx Reductions from Non-RECLAIM Ovens, Dryers, and Furnaces. Emission reductions from the equipment addressed by Rule 1147 and Control Measure CMB-01 of the 2007 AQMP were proposed to be regulated in earlier AQMPs (e.g., Control Measure 97CMB-092 from the 1997 AQMP).

Control measure MCS-01 was a new control measure developed for the 2007 AQMP that proposes companies upgrade their current technology to best available control technology (BACT) – the cleanest technology available. The facility modernization control measure proposes that equipment operators meet best available control technology (BACT) emission limits at the end of the equipment's useful life. For equipment regulated by Rule 1147, modernization requires burner upgrades, replacement of burner systems or replacement of equipment when the equipment reaches 15 to 20 years of age.

Equipment that is regulated by Rule 1147 and PR 1153.1 must also meet the requirements of SCAQMD Regulation XIII – New Source Review (NSR) and SCAQMD Regulation IV – Prohibitions. Equipment subject to NSR must meet BACT requirements and offset emission increases. Regulation IV limits emissions of particulate matter, carbon monoxide and NOx from combustion sources. However, NOx emission limits required by BACT are significantly more stringent than the emission limits in Regulation IV. For example, Rule 474 – Fuel Burning equipment – Oxides of Nitrogen has emission limits that vary from 125 ppm to 400 ppm

(referenced to 3% oxygen) depending upon the fuel and heat input rating of the equipment. NOx emission limits under BACT for combustion equipment subject to Rule 1147 vary from 30 ppm to 60 ppm (referenced to 3% oxygen). Rule 407 in Regulation IV also has a CO limit of 2,000 ppm.

Rule 1147 was adopted in 2008 to address NOx emissions from miscellaneous sources not regulated by other SCAQMD rules within Regulation XI. Due to the numbers of pieces of equipment and varying source categories a top down assessment* was conducted to determine emissions limits based on thermal process characteristics and establish implementation dates. This process resulted in several categories of equipment that had similar burner profiles being grouped together with a common set of emissions limits for defined process temperatures. As a result of the common burner traits, food ovens, roasters and smokehouses were grouped in the same category as dehydrators, dryers, heater, kilns, crematories, incinerators, calciners, furnace and heated storage tanks. BACT for ovens and dryers had been 30 ppm NOx since 1998 and the Rule 1147 NOx limit of 30 ppm or 60 ppm if the process temperature is above 1,200°F was consistent with applications for the other categories of equipment. . However, stakeholders were concerned that achieving an emission concentration of 30 ppm would be difficult in older food oven, roaster and smokehouse equipment using ribbon burners. Responding to stakeholder concerns, Rule 1147 provided a later compliance date, until 2014, for food ovens.

In June of 2012, staff began an evaluation of Rule 1147 implementation. The evaluation focused on the costs associated with and the availability of burner technologies for several categories of equipment covered by the rule. In May 2013 SCAQMD Rules 219 and 222 were amended to exempt specific small equipment from permit requirements including food ovens with low emissions of VOCs. One of the reasons cited for the rule amendment was the lack of cost effective -compatible low NOx burners available to meet the requirements of Rule 1147. The Rule 219 amendment moved some small ovens from the permit program into the Rule 222 registration program which exempts them from Rule 1147 and PR 1153.1.

Concurrently, manufacturers and a research institute had started projects to lower NOx emissions from these types of burners and were expected to achieve the Rule 1147 emission limits by 2014. Because these projects have not been completed and there are many older ovens heated with ribbon burners in the SCAQMD, staff proposed to move existing (in-use) food ovens, dry roasters and smokehouses from Rule 1147 and place them in a new rule specific to these equipment. Staff is recommending a new rule with higher NOx emission limits and delay of the emission limit compliance dates for in-use SCAQMD permitted food ovens. New food ovens will be subject to the BACT requirements of new source review. Staff is also proposing a carbon monoxide emission limit for units regulated by PR 1153.1.

* In a top down assessment an overview of the system of equipment is formulated specifying but not detailing any first level of equipment subsystems. Each subsystem is then refined in yet greater detail. This type of assessment is typically used whenever there are thousands of equipment of differing processes such as equipment subject to SCAQMD Rule 1147.

TECHNOLOGY ASSESSMENT

There are several options for reducing NOx emissions from combustion equipment subject to PR 1153.1. Some ovens may be able to change their process so heat is generated by electricity. Many ovens use heat generated by electricity. Other ovens may be able to use heat generated by a boiler or thermal fluid heater. Heat transfer from steam or thermal fluids can be an efficient and cost effective way to heat a process. However, heat transfer from a boiler or thermal fluid heater requires the use of a heat exchange system to warm air and the process chamber that heats the product. For the majority of processes however, the preferred option to reduce NOx emissions will be tuning or replacing the burner system. The following sections describe the typical burner designs used in food ovens, roasters and smokehouses and the methods to reduce NOx.

Process Equipment

PR 1153.1 regulates ovens, roasters, and smokehouses used to prepare food and beverages for human consumption. There are two main types of ovens – batch and conveyor ovens. Roasters and smokehouses are typically batch operations where product is placed in the oven and removed when the process is complete. Conveyor ovens continuously take in food items, cook them and delivery the cooked product to an area where it can cool and then be packaged. Regardless of the type of food oven, they operate in three temperature ranges – less than 500 °F, 500 to 900 °F and greater than 900 °F.

Both batch and conveyor ovens may be manufactured with ribbon burners or one of two types of air heating burners. Air heating burners are used in convection ovens where the burner is not in close proximity to the product being cooked. One type of air heating burner is a line or duct burner that is often made up of one foot sections that can be put together in a variety of shapes but in food ovens are typically put together end to end. The other type of air heating burner has a cylindrical housing projecting into the oven in which the burner flame is contained. Both of these types of burners may fire into a small space and air is moved through that space by blowers to be heated and moved on to the main chamber of the oven.

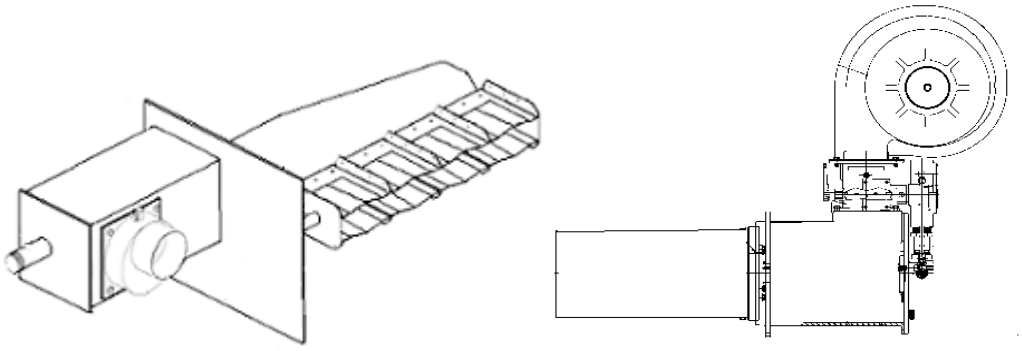

Figure 1 – Air Heating Burners

Many oven burners have historically been long sections of pipe with rows of holes down the length of the pipe. Gas and a small amount of air is introduced into the pipe and that mixture exits through the holes in the pipe where it is lit with a pilot flame. Most of the air for combustion is secondary air which is inside the oven and mixes with the gas as it exits the holes in the pipe.

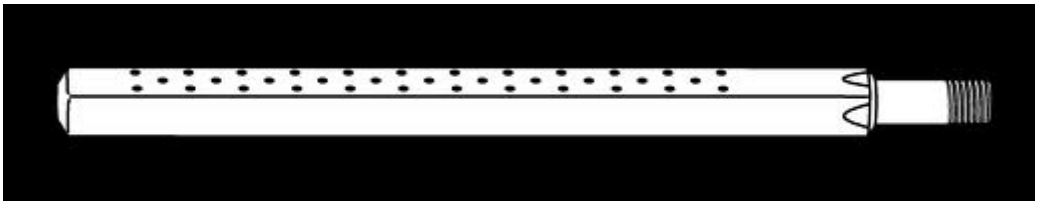

Figure 2 – Pipe Burner

Ribbon burners are similar to this older style of pipe burner but they have an insert along the length of the pipe that allows better control of the flame. They are also designed to provide premixing of air with fuel for more efficient and better control of combustion. The newest types of ribbon burners are made in a variety of ways, but they have better mixing of air with the fuel inside the body of the burner and better control of the distribution of fuel gas in the burner which result in lower NOx emissions and better efficiency. The lower emissions are also achieved because the flame that is produced has lower peak flame temperature which results in less NOx. Some versions of newer ribbon burners also include water cooling which can also help lower emissions. Together with modern control systems, ribbon burners have lower emissions than pipe and older ribbon burners.

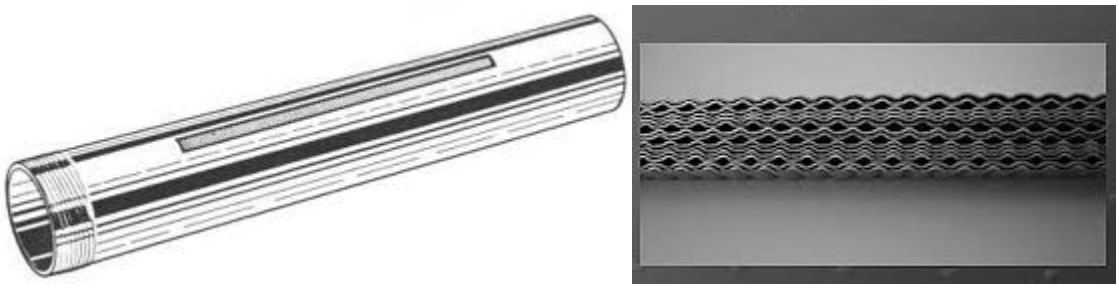

Figure 3 – Ribbon Burner Pipe and Flame Holding Surface

Food ovens can also use radiant systems to provide heat. One type of burner, made with ceramic or metal fiber flame holding surfaces, produces most of their heat as infrared radiation; they produce a red glow, and have very low NOx emissions. These are often called infrared burners and directly heat the product in the oven. Another type of unit has burners which heat the inside of tubes and the tubes then radiate heat to the process. This indirect heating system is called radiant tube heating.

Figure 4 – Infrared Burners

Emission Reduction Technology

Low NOx burners in some applications can achieve less than 10 ppm NOx. There are many types of burners with emission in the range of 20 to 60 ppm NOx. The manufacturers of these burners use a variety of techniques to achieve lower emissions. The principal technique is better premixing of fuel and air before combustion takes place. This results in more efficient combustion of fuel and a more uniform flame temperature. A more uniform flame temperature results in fewer hot spots and reduced formation of NOx.

Many premix burners require the aid of a blower to mix the fuel with air before combustion takes place (primary air). However, residential tank type water heaters, some small boilers and other equipment are now made with atmospheric premix burners that achieve NOx emissions in the range of 15 to 60 ppm. Atmospheric burners do not use a blower to mix fuel and air. The burners in these units combine premixing with specially designed burner heads that reduce flame temperature and NOx emissions by spreading the flame over a larger area. Premixing of fuel and air is accomplished using a jet of fuel gas exiting a specially designed nozzle. The velocity of the fuel leaving the nozzle draws air into a mixing zone and mixing is completed before the fuel and air mixture leaves the burner.

A variety of burners are designed to spread flames over a larger area to reduce hot spots and lower NOx emissions. One type, radiant premix burners, has been available for several decades. Radiant premix burners are made with ceramic, sintered metal, metal screen or metal fiber heads that spread the flame over a larger surface. These burners can be run in either radiant or blue flame modes. When a burner runs in radiant mode, the flame surface is red instead of blue and it produces more radiant heat. These burners come in a variety of shapes including flat and cylindrical.

To further reduce NOx emissions, some premix burners also use staged combustion. This technique produces two combustion zones with differing air-fuel mixtures. The burner produces a fuel rich zone to start combustion and stabilize the flame and a fuel lean zone to complete combustion and reduce the peak flame temperature. In combination, these two zones reduce the formation of NOx. This technique incorporates premixing and can be used in combination with other techniques.

Burner Technology for Food Ovens

Rule 1147 requires food oven, roasters and smokehouse equipment to meet NOx emission limits in the range of 30 ppm to 60 ppm (referenced to 3% oxygen) depending upon the process and process temperature. The emissions limit is segregated by temperature equaling or exceeding 1200^{o}F where the higher 60 ppm limit applies. The NOx emissions limit for all other oven operations at temperatures less than 1200^{o}F is set at 30 ppm. The emission limits are based on SCAQMD and other air district's determinations for BACT, availability of burners that can achieve these emission levels and recent emission limits decisions for SCAQMD permits. BACT determinations since 1998 have resulted in emission limits of 30 to 60 ppm for equipment ranging from low temperature ovens to very high temperature metal melting and heat treating furnaces. The BACT NOx limit since 1998 for most ovens and dryers, including food ovens, has been 30 ppm. Currently, the typical emission for low NOx burners applicable to equipment subject to Rule 1147 varies from less than 20 ppm to 60 ppm depending upon the burner, process temperature and nature of the process.

Prior to 1998, NOx emissions limits for food ovens were typically established as an operating condition of the equipment permit. Many of the food ovens subject to Rule 1147 that are currently operating in the SCAQMD predate the 1998 timeframe when BACT was established for the equipment category. As a consequence, the Rule 1147 NOx emissions limits based on the post 1998 BACT analyses have presented the older and more process specific equipment with a significant compliance challenge. It is also important to note that the Rule 1147 1200^{o}F temperature threshold represented a consensus for several categories of equipment, not restricted only to food ovens, roasters or smokehouses. A review of the sources for which PR 1153.1 would apply indicated that a lower temperature threshold combined with a minor relaxation in the emissions limit from 30 ppm to 40 ppm for the cooler operating processes would better fit the operational characteristics of the impacted equipment.

Food ovens are designed with a specific type of burner so that the oven can produce specific food products. Many ovens use ribbon burners. Changing the type of burner and the operational characteristics of the oven and burners can result in changes in taste, texture, appearance and other qualities of the product. Individual manufacturers of food products set up their ovens differently in order to produce their unique product. This situation has resulted in manufacturers using ovens that are 20 to 50 years old. Because food producers require specific types of oven and burner combinations and most ovens are decades old, it is often technically infeasible for these older units to comply with the emission limits for Rule 1147 and produce an identical food product.

PR 1153.1 has proposed NOx emission limits for existing in-use equipment of 40 to 60 ppm for processes below and above 500°F. These proposed NOx emission limits are based on comments from equipment and burner manufacturers and local businesses. For older in-use food ovens fired with ribbon burners, local businesses and a major customer of ribbon burner manufacturers proposed NOx emission limits in the range of 30 to 35 ppm for process temperatures less than about 500°F, 45 ppm for process temperatures between 500 °F and 700°F and 60 ppm for temperatures above 700°F. Ribbon burner manufacturers have suggested temperature based NOx emission limits for new food ovens as low as 30 ppm for lower process temperatures below

about 500°F and 60 ppm for higher process temperatures above about 900 °F. For process temperatures between about 500 and 900 °F an emission limit of 45 ppm was suggested. The PR 1153.1 NOx emission limit for existing in-use equipment of 40 ppm for processes below 500 °F has been set to bridge the suggested range proposed by the stakeholders between 35 and 45 ppm. Similarly, providing a higher 60 ppm limit for the 500°F to 1200°F range of operation will provide flexibility for units operating for variable temperature requirements in cooking. New and relocated food ovens will be subject to SCAQMD new source review requirements and BACT guidelines.

The Gas Company and the Gas Technology Institute have a project to reduce emissions from ribbon burners. The design goal is to achieve NOx emissions of 30 ppm across a wide range of temperatures. The project is currently moving from testing of burners to installation of the modified burners into test ovens. The project is expected to be completed in 2016. Individual burner manufacturers also have developed new burners to achieve NOx emissions of 30 ppm across a wide range of process temperatures.

To meet PR 1153.1 emission limits, some ovens with ribbon burners will only require tuning and regular maintenance. In other cases, compliance with the emission limits will require replacement with newer design lower emitting burners and/or upgrades to burner control systems.

Air heating and infrared burners used in food ovens can easily achieve the emission limits of PR 1153.1 and are the basis for the BACT NOx limit of 30 ppm for most ovens and dryers. These burners are readily available. These burners and some older design air heating burners will achieve the emission limits in PR 1153.1.

Radiant tube heating systems can also achieve the emission limits of PR 1153.1 but would require replacement with larger diameter heating tubes in order to use burners that will meet the proposed NOx limits. Alternatively, these types of ovens have an option from the manufacturer to use a thermal fluid radiant tube heating system where the thermal fluid in the radiant tubes is heated by a small process heater subject to Rules 1146.1 or 1146.2. In addition, some of these radiant tube heating ovens have an option from the manufacturer to be heated with direct fired air heating burners. Both of these types of heating systems achieve NOx emissions levels of 15 to 30 ppm based on existing in-use permitted units in the SCAQMD permit database.

There are many suppliers of ribbon burners for food ovens and many manufactures of air heating and radiant burners used in food ovens and roasters. Currently suppliers of ribbon burners for food ovens have products that will achieve the proposed NOx limits for the equipment regulated by PR 1153.1. The suppliers of other types of burners which are typically found in food ovens also produce burners that meet the NOx limits in Rule 1147 and PR 1153.1.

AFFECTED INDUSTRIES

Proposed Rule 1153.1 affects manufacturers of ovens, roasters and smokehouses (NAICS 333) and manufacturers of food and beverage products (NAICS 311 and 312). Staff has identified 94 facilities with 210 total units that are expected to be regulated by PR 1153.1. 135 of the units are

small with emissions less than or equal to one pound per day NOx. Approximately 70 % of the units are food ovens and the remainder is roasters and smokehouses.

PUBLIC PROCESS

The rule development effort for PR1153.1 is part of an ongoing process to evaluate low NOx technologies for combustion equipment subject to SCAQMD Rule 1147. To date, SCAQMD staff has held three PR 1153.1 Task Force meetings to discuss burner technology, implementation issues, compliance schedules, emission limits, emission testing, and other topics with representatives from affected manufacturers, trade organizations, and other interested parties. PR 1153.1 Task Force meetings were held on October 23, 2013, January 9, 2014, and March 6, 2014 in combination with Rule 1147 Task Force meetings. In addition, a Public Workshop for PR 1153.1 was held on April 2, 2014 and PR 1153.1 was discussed at the Stationary Source Committee on March 21 and July 25, 2014.

CHAPTER 2: SUMMARY OF PROPOSED RULE 1153.1

PROPOSED AMENDED RULE REQUIREMENTS

PROPOSED RULE REQUIREMENTS

AQMP Control Measure

Control measure CMB-01 – NOx Reductions from Non-RECLAIM Ovens, Dryers, and Furnaces and control measure MCS-01 – Facility Modernization provide a framework for Rule 1147 and PR 1153.1. Control measure MCS-01 proposes that equipment operators meet best available control technology (BACT) emission limits at the end of the equipment's useful life. Control measure CMB-01 proposes emission NOx limits in the range of 20 ppm to 60 ppm (referenced to 3% oxygen) for ovens, dryers, kilns, furnaces and other miscellaneous combustion equipment based on BACT limits. Unlike Rule 1147, PR 1153.1 is based on best available retrofit control technology (BARCT) and has less stringent NOx emission limits than Rule 1147. To meet PR 1153.1 emission limits, equipment will require tuning and regular maintenance and in some cases, replacement with lower emitting burners or upgrades to burner control systems.

Purpose and Applicability

The purpose of PR 1153.1 is to limit nitrogen oxide emissions from gaseous and liquid fuel fired combustion equipment as defined in this rule. This rule applies to in-use ovens, dryers, smokers and dry roasters with nitrogen oxide emissions from fuel combustion that require a District permit and are used to prepare food or beverages for human consumption. This rule does not apply to solid fuel-fired combustion equipment, fryers (including those used for oil roasting of nuts, seeds and other products), char broilers, or boilers, water heaters, thermal fluid heaters and process heaters subject to District Rules 1146, 1146.1, or 1146.2.

Requirements

PR 1153.1 sets NOx emission limits of 40 to 60 ppm and a CO limit of 800 ppm. A CO emission limit will ensure that burners are operated consistent with manufacturers operating guidelines. The temperature of the oven will vary depending upon the product baked. The NOx and CO levels will vary depending upon the heat output of the burner. The 800 ppm CO emission limit will also provide operators flexibility for operating equipment that process more than one type of product.

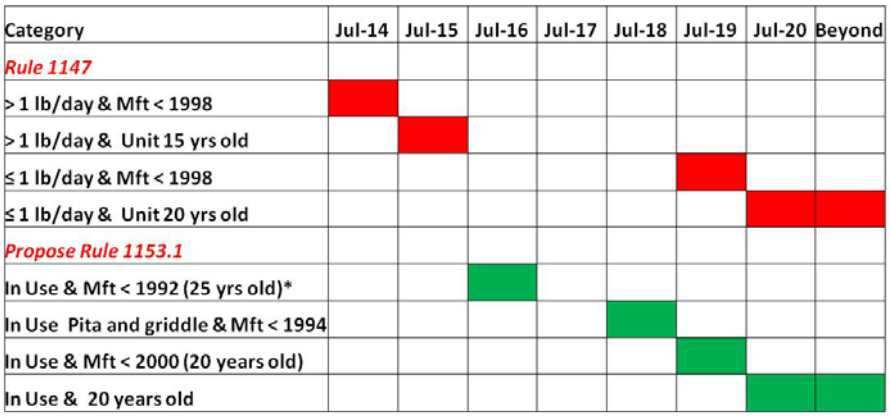

Figure 5 – Proposed Rule 1153.1 Compliance Schedule

The proposed rule also includes an emission testing requirement but delays compliance dates for at least 2 additional years beyond the dates for Rule 1147. PR 1153.1 phases in compliance based on a 20 year equipment life instead of the 15 years used in Rule 1147. Figure 5 compares the compliance schedules of Rule 1147 and PR 1153.1.

PR 1153.1 also provides three alternate compliance options and an option for manufacturers to certify emissions. One alternate compliance option allows facilities with multiple units to phase in compliance over three to five years. A second alternate compliance option allows facilities to delay the emission limit compliance date by 5 or 10 years if they recently replaced all of the burners in an oven. A mitigation fee option provides facilities a third option to delay compliance by up to three years by paying a mitigation fee which will be used to fund emission reduction projects.

The following two tables indicate the NOx emission limits and compliance dates for PR 1153.1.

Table 1 – NO_x Emission Limit for In-Use Units

NOx Emission Limit PPM @ 3% O_2, dry or Pound/mmBTU heat input	
Process Temperature	
≤ 500° F	*> 500° F*
40 ppm or 0.042 lb/mmBTU	60 ppm or 0.073 lb/mmBTU

Table 2 – Compliance Schedule for In-Use Units

Equipment Category(ies)	Permit Application Shall be Submitted By	Unit Shall Be in Compliance On and After
Griddle ovens and ovens used solely for making pita bread and manufactured prior to 1999	October 1, 2017	July 1, 2018
Ovens heated solely by indirect-fired radiant tubes manufactured prior to 2002	October 1, 2021	July 1, 2022
Other unit manufactured prior to 1992	October 1, 2015	July 1, 2016
Other unit manufactured from 1992 through 1998	October 1, 2018	July 1, 2019
Ovens heated solely by indirect-fired radiant tubes manufactured after 2001 and any other unit manufactured after 1998	October 1 of the year prior to the compliance date	July 1 of the year the unit is 20 years old

PR 1153.1 will provide a later compliance date for existing (in-use) units making pita bread or using small diameter indirect fired radiant tube heating. New ovens built with radiant tube heating have options from the manufacturer to be built with a thermal fluid radiant tube heating system using a small process heater subject to SCAQMD Rules 1146.1 or 1146.2. In addition,

some of these ovens also have an option from the manufacturer for direct fired heating systems using air heating burners which can meet the proposed NOx emission limits. Information from the SCAQMD permit system indicates that both types of heating systems achieve NOx emissions in the range of 15 to 30 ppm and low CO emissions in these types of applications. In addition, there are burners available for larger diameter radiant tubes which can also meet emission levels of less than 30 ppm NOx.

Exemptions

PR 1153.1 includes exemptions from the emission limits and testing for small and low-use units with NOx emissions of one pound per day or less. In addition, the proposed rule includes a testing exemption for units that only have infrared burners which have significantly lower NOx emissions than the limits in PR 1153.1.

CHAPTER 3: IMPACT ASSESSMENT

IMPACT ANALYSIS

COST EFFECTIVENESS

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) ANALYSIS

SOCIOECONOMIC ASSESSMENT

INCREMENTAL COST-EFFECTIVENESS

COMPARATIVE ANALYSIS

IMPACT ANALYSIS

PR 1153.1 impacts over 200 ovens, roasters and smokehouses at approximately 100 facilities. The proposed rule will exempt two thirds of the ovens from emission limit requirements (small and low use units). The owners and operators of these units are still subject to the combustion system maintenance and recordkeeping requirements that are carried over from Rule 1147. The maintenance requirements will help limit NOx, CO, VOC and PM emissions from these units. An estimated 75 units would still be required to meet PR 1153.1 emission limits and demonstrate compliance through source testing. It is expected that most of the larger ovens will be able to comply with the proposed emission limits without changing burner systems.

Emissions of CO, VOC and PM are not expected to change compared with Rules 1147. However, NOx emission reductions for PR 1153.1 are delayed compared with Rule 1147 and will result in about 120 pounds per day of NOx emissions forgone by 2023. PR 1153.1 is not anticipated to have any additional significant environmental impacts.

COST EFFECTIVENESS

The proposed rule amendment provides less stringent emission limits compared with Rule 1147 and provides regulatory relief. As such, a cost effectiveness analysis for PR 1153.1 is not applicable. However, staff has reviewed and reaffirmed the applicability of the cost and cost effectiveness estimates for Rule 1147. The cost for ovens to comply with PR 1153.1 emission limits will vary depending upon the type of burners used in the oven.

A few ovens with air heating burners may need to replace burners in order to meet PR 1153.1 emission limits. For those ovens the cost and cost effectiveness estimated for Rule 1147 is applicable. However, for higher temperature ovens and many other ovens, the cost will be less than for Rule 1147 because their current burners can meet the PR 1153.1 NOx emission limits of 40 and 60 ppm. The following table lists Rule 1147 average cost for air heating burners in the size range used by food ovens.

Burner Size (mmBtu/hr)	30 ppm	60 ppm
Less than 0.5	$6,800	$2,500
1	$3,500	$2,000
2.5	$5,500	$3.500
5	$5,000	$5,000

Table 3 – Average Burner Cost for Rule 1147 Adoption

Rule 1147 cost effectiveness is based on replacement of burners and other related costs. The average cost effectiveness for burner replacement for Rule 1147 was up to $20,000 per ton. This is an average cost effectiveness based on the wide range of burners and equipment subject to Rule 1147 emission limits. However, staff does not anticipate that most of the ovens using air heating burners will need to replace their burners. Newer ovens in the SCAQMD with air

heating burners have permits limits of 30 ppm NOx (the current SCAQMD NOx BACT limit for ovens and dryers).

Food ovens using ribbon burners require regular replacement of burners on a frequency that varies from every year to every 10 years depending upon use and type of burner. The cost effectiveness of installing new burners with lower NOx emissions is the price difference between a new type of burner and the older style burners. The typical cost of individual ribbon burners for ovens cooking cookies, crackers and bread is in the range of $250 to $800. If ribbon burners are replaced with infrared/radiant pipe burners designed as a direct replacement for ribbon burners, the cost per burner would be $315 to $1000. The cost difference between ribbon burners and the infrared burners for an oven rated at 2 million Btu per your would be in the range of $12,000 to $17,000. With a NOx emission reduction of 4 tons or more over 20 years, the average cost effectiveness is around $3,000 to $4,000 per ton NOx reduced.

In some cases an owner may choose to use a new updated control system with ribbon burners in order to meet the emission limit. Depending upon the size of the oven and number of burners, a modern burner control system can cost $25,000 to $75,000 dollars. However, with an emission reduction of at least 4 tons of NOx over 20 years for a conveyor oven and an average cost of $50,000 for a new control system on a large oven, the average cost effectiveness of the control system is about $12,500/ton NOx reduced. This control systems cost and cost difference is in the range for other Rule 1147 equipment.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) ANALYSIS

Pursuant to the California Environmental Quality Act (CEQA) and SCAQMD's Certified Regulatory Program (Rule 110), the SCAQMD has prepared a Draft Environmental Assessment (EA) for Proposed Rule 1153.1. The Draft EA was released for a 45-day public review and comment period on July 29 through September 16, 2014. The Draft EA concluded that significant environmental impacts in the topic area of air quality would result from implementing the proposed project. The proposed project may have statewide, regional or area-wide significance; therefore, a CEQA scoping meeting was required (pursuant to Public Resources Code §21083.9(a)(2)). The public workshop conducted on April 2, 2014 also served as a CEQA scoping meeting for the proposed actions. Upon completion of the public review and comment period for the Draft EA, responses to comments received relative to the Draft EA will be prepared and incorporated into the Final EA.

SOCIOECONOMIC ASSESSMENT

Based on stakeholder input and evaluation of the technical feasibility of technologies applicable to older food ovens, staff has proposed to move existing in-use food ovens, including roasters and smokehouses, from Rule 1147 and place them in a proposed new rule with less stringent emission limits and later compliance dates.

As such, PR 1153.1 is expected to impose lower costs than Rule 1147. The reduced equipment replacement cost (savings) for small and low use ovens exempt from the PR 1153.1 emission limits will be on the order of $2,500 to $7,500 per burner. The proposed rules' maintenance, recordkeeping and testing requirements, which apply to all food ovens, are the same as in Rule 1147 and will result in the same cost. Similar to Rule 1147, PR 1153.1 has a testing requirement.

Testing cost will vary from $2,000 to $5,000 depending upon the type of equipment. Most of the food ovens are small or low use, they will not be required to do emissions testing, and will therefore see this cost savings. PR 1153.1 also has later compliance dates compared with Rule 1147 which delays the costs from equipment replacement and testing for larger units.

Operators of large ovens with ribbon burners may choose to replace older design ribbon burners with new design burners or upgrade to a new control systems. As discussed in the previous section on cost effectiveness in this staff report, these costs are similar to the costs estimated for Rule 1147. The cost difference for lower emission burners for a 2 million Btu per hour oven is estimated to be less than $20,000 and the cost of a new control system averages about $50,000. Which option an owner/operator chooses will depend on the variety of products made in the oven and other operational factors.

DRAFT FINDINGS UNDER CALIFORNIA HEALTH & SAFETY CODE SECTION 40727

California Health and Safety Code Section 40727 requires that prior to adopting, amending or repealing a rule or regulation, the SCAQMD Governing Board shall make findings of necessity, authority, clarity, consistency, non-duplication, and reference based on relevant information presented at the public hearing and in the staff report. In order to determine compliance with Sections 40727, 40727.2 require a written analysis comparing the proposed amended rule with existing regulations.

The following provides the draft findings.

Necessity: A need exists to adopt PR 1153.1 to address technical infeasibility and the need for additional time to retrofit food ovens, roasters and smokehouses to meet the new less stringent proposed NOx emission limits.

Authority: The SCAQMD obtains its authority to adopt, amend, or repeal rules and regulations from California Health and Safety Code Sections 39002, 40000, 40001, 40440, 40440.1, 40702, 40725 through 40728, 41508, and 41700.

Clarity: PR 1153.1 has been written or displayed so that its meaning can be easily understood by the persons affected by the rule.

Consistency: PR 1153.1 is in harmony with, and not in conflict with or contradictory to, existing federal or state statutes, court decisions or federal regulations.

Non-Duplication: PR 1153.1 does not impose the same requirement as any existing state or federal regulation, and is necessary and proper to execute the powers and duties granted to, and imposed upon the SCAQMD.

Reference: In amending this rule, the following statues which the SCAQMD hereby implements, interprets or makes specific are referenced: Health and Safety Code sections 39002, 40001, 40702, 40440(a), and 40725 through 40728.5.

INCREMENTAL COST-EFFECTIVENESS

Health and Safety Code Section 40920.6 requires an incremental cost-effectiveness analysis for Best Available Retrofit Control Technology (BARCT) rules or emission reduction strategies when there is more than one control option that would achieve the emission reduction objective of the proposed amendments, relative to ozone, CO, SOx, NOx, and their precursors.

The proposal to adopt PR 1153.1 does not require additional emission controls or emission reduction strategies beyond those required under SCAQMD Rule 1147. However, PR 1153.1 does require a less stringent emission limit and later compliance dates compared with Rule 1147 which currently applies to this equipment. Therefore, the incremental cost-effectiveness analysis requirement does not apply.

The only other options for reducing NOx emission from equipment affected by PR 1153.1 is replacement of burners with other sources of heat. Some ovens do use electricity to provide heat and other units provide heat through a heat exchanger with heated water of other fluid from a small boiler or process heater. However, this equipment is either not regulated for NOx emissions by the SCAQMD (electric ovens) or is regulated by other SCAQMD rules (Rules 1146, 1146.1 and 1146.2).

Staff has evaluated the incremental cost effectiveness as compared to a less stringent emission limit. The same technology used to achieve the proposed NOx limit can also be used to achieve less stringent limits. For these less stringent limits the cost of the technology is the same but because emission reductions are less, the cost effectiveness increases. In other words, a less stringent option is less cost-effective.

COMPARATIVE ANALYSIS

Under Health and Safety Code Section 40727.2, the SCAQMD is required to perform a comparative written analysis when adopting, amending, or repealing a rule or regulation. The comparative analysis is relative to existing federal requirements, existing or proposed SCAQMD rules and air pollution control requirements and guidelines which are applicable to industrial, institutional, and commercial water heaters, boilers, steam generators, and process heaters.

The SCAQMD staff is not aware of any state or federal requirements regulating air pollution that are applicable to PR 1153.1 type units. PR 1153.1 does not make an existing limit or standard more stringent, or impose more stringent monitoring, reporting or recordkeeping requirements. However, PR 1153.1 does include a less stringent emission limit and later compliance dates compared with Rule 1147 which currently applies to this equipment. Since PR 1153.1 is only applicable to existing in-use ovens, roasters and smokehouses it does not conflict with Best Available Control Technology requirements under the SCAQMD's New Source Review Program.

REFERENCES

REFERENCES

EPA, 2002. *EPA Air Pollution Control Cost Manual, Sixth Edition (EPA-452-02-001),* United Stated Environmental Protection Agency, January 2002

SCAQMD, 2008. *Staff Report: Proposed Rule 1147* - NOx Reductions from Miscellaneous Sources. South Coast Air Quality Management District, December 2008.

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

SCAQMD, 1996. *1997 Air Quality Management Plan, Appendix IV-A, Stationary and Mobile Source Control Measures,* South Coast Air Quality Management District, November 1996.

RESPONSE TO COMMENTS

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Comment: Because Rule 1147 is an approved rule in the state implementation plan (SIP), forgone emissions reductions associated with PR1153.1 could interfere with demonstration of attainment or reasonable further progress under section 110(l) of the federal Clean Air Act (CAA) or other provisions of the CAA. In addition, PR 1153.1 may undermine the rules enforceability and preclude reliance on it for SIP emission reduction credit in accordance with USEPA policy on economic incentive programs (EIPs) and other nontraditional emission reduction measures. USEPA approval of PR 1153.1 depends upon demonstration that its provisions, including fee provisions, result in emission reductions that are surplus, quantifiable, enforceable, permanent and consistent with all applicable CAA requirements.

Response: The SCAQMD 2007 and 2012 Air Quality Management Plan SIPs set aside sufficient NOx emissions reductions to offset potential emission reduction shortfalls resulting from delays in implementing technology forcing rules. Therefore, the potential SIP reductions foregone/delayed are addressed- via the SIP set aside, not incentive programs.

Comment: Ovens using indirect fired radiant tube heating with small diameter tubes will not be able to meet the proposed NOx and CO emission limits.

Response: Staff has revised PR 1153.1 to provide existing (in-use) units using indirect fired radiant tube heating additional time to meet the rule emission limits and testing requirement. Until the compliance date, these units must comply with the other requirements of PR 1153.1 including combustion system maintenance and recordkeeping. These ovens have options from the manufacturer to convert to a thermal fluid radiant tube heating system, and some ovens also have an option from the manufacturer for direct fired heating systems using air heating burners. Staff recognizes that units with small diameter indirect fired heating tubes do not currently have burners available that meet the proposed emission limits. However, units can be built with thermal fluid heating using a small process heater subject to SCAQMD Rules 1146.1 or 1146.2 or with direct fired air heating burners which can meet the proposed emission limits. Information from the SCAQMD permit system indicates that both of these types of heating systems achieve NOx emissions in the range of 15 to 30 ppm and low CO emissions in these types of applications. In addition, there are burners available for larger diameter radiant tubes which can meet emission levels of less than 30 ppm NOx.

Comment: Ovens with recently installed burners should have more time to comply with the emission limits regardless of the equipment age. This option is available in Rule 1147.

Response: Staff has revised PR 1153.1 to allow additional time for units that recently changed burners. Units with recent changes of burners will have 5 or 10 years from the date of the modification to comply with the emission limits. The 5 or 10 year time frame is based on industry provided information on the maximum lifetime of ribbon burners in small and large baking operations and is based upon the hours of operation of the oven.

Comment: Why is a carbon monoxide (CO) limit included in PR 1153.1 and what is the basis for the limit?

Response: A CO limit is included in the proposed rule to assure that the burner is tuned and operated in a manner consistent with manufacturer's recommendations. Staff has found that

some equipment subject to Rule 1147 have burners that were never designed to meet rule emission limits, but they have been tuned to meet the NOx limit during the test with very high CO levels. The CO emission level is set at a capping level to allow owner/operators flexibility during normal operations and at the same time assure that burners are tuned and operated as they were designed.

Comment: Are the PR 1153.1 testing and compliance requirements different than those for Rule 1147 equipment with more than one section and with more than one section connected to one exhaust manifold?

Response: The test methods (sampling and analysis) are the same for both rules. The protocol for sampling for Rule 1147 and PR 1153.1 compliance demonstrations must be discussed between the owner/operator and SCAQMD staff and ultimately approved by SCAQMD staff. The owner/operator and their testing contractor should address this, and other issues that affect sampling, with SCAQMD staff to reach a consensus on how to sample for the compliance demonstration. Compliance demonstration for units with individual sections and with their own exhaust stacks are subject to long established Engineering and Compliance Division policy regarding compliance demonstration. This policy requires that all sections of a piece of equipment with individual manifolds must comply with federal and SCAQMD regulatory requirements (e.g., federal new source performance standards, BACT emission limits, and SCAQMD Rules).

Comment: Is it possible to get refunds on permit and alternate compliance applications for Rule 1147 if they are no longer necessary? Will there be a cost to change a permit condition applicable to Rule 1147?

Response: The request is being addressed by SCAQMD Engineering and Compliance Division. The SCAQMD Small Business Assistance staff can also be contacted for business assistance at (800) 388-2121.

Comment: Does this proposed rule affect equipment at RECLAIM facilities?

Response: **E**quipment at RECLAIM facilities is exempt from PR1153.1.