SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Preliminary Draft Staff Report

Proposed Amended Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters

Proposed Amended Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters;

Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters; and

Proposed Rule 1100 - Implementation Schedule for NOx Facilities

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Contents

BACKGROUND

The South Coast Air Quality Management District (SCAQMD) Governing Board adopted the Regional Clean Air Incentives Market (RECLAIM) program in October 1993. The purpose of RECLAIM is to reduce NOx and SOx emissions through a market-based approach. The program replaced a series of existing and future command-and-control rules and was designed to provide facilities with the flexibility to seek the most cost-effective solution to reduce their emissions. It also was designed to provide equivalent emission reductions, in the aggregate, for the facilities in the program compared to what would occur under a command-and-control approach. Regulation XX includes a series of 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. Portions of Regulation XX – RECLAIM was most recently amended on December 4, 2015, October 7, 2016, and January 5, 2018. The December 2015 amendment was designed to achieve programmatic NOx RECLAIM trading credit (RTC) reductions of 12 tons per day from compliance years 2016 through 2022 and the October 2016 amendment was to address RTCs from facility shutdowns.

In response to concerns regarding actual emission reductions in the RECLAIM program under a market-based approach, Control Measure CMB-05 of the 2016 Air Quality Management Plan (AQMP) committed to an assessment of the RECLAIM program in order to achieve further NOx reductions of five tons per day, including actions to sunset the program and ensure equivalency to Best Available Retrofit Control Technology (BARCT) levels through a command-and-control regulatory structure. During the adoption of the 2016 AQMP, the Resolution directed staff to modify Control Measure CMB-05 to achieve the five tons per day of NOx emission reductions as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT level controls as soon as practicable. Staff provided a report on transitioning the NOx RECLAIM program to a command-and-control regulatory structure at the May 5, 2017 Governing Board meeting and is providing quarterly updates to the Stationary Source Committee with the first quarterly report provided on October 20, 2017.

On July 26, 2017 California State Assembly Bill 617 was approved by the Governor, which addresses non-vehicular air pollution (criteria pollutants and toxic air contaminants). It is a companion legislation to Assembly Bill 398, which was also approved, and extends California's cap-and-trade program for reducing greenhouse gas emissions from stationary sources. RECLAIM facilities that are in the cap and trade program are subject to the requirements of AB 617. Among the requirements of this bill is an expedited schedule for

implementing BARCT for cap and trade facilities. Air Districts are to develop by January 1, 2019 an expedited schedule for the implementation of BARCT no later than December 31, 2023. The highest priority would be given to older, higher polluting units that will need to install retrofit controls.

Staff conducted a programmatic analysis of the RECLAIM equipment at each facility to determine if there are appropriate and up to date BARCT NOx limits within existing SCAQMD command-and-control rules for all RECLAIM equipment. It was determined that command-and-control rules would need to be adopted and/or amended to provide implementation timeframes for achieving BARCT compliance limits for certain RECLAIM equipment and to also update some of these rules if the emission limits do not reflect current BARCT.

Rules 1146, 1146.1 and 1146.2 are the first set of command-and-control regulations to be amended to address RECLAIM equipment. Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters applies to existing boilers, steam generators, and process heaters with maximum rated heat input capacities greater than or equal to 5 million British thermal units per hour (MMBtu/hr). Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters applies to boilers, steam generators, and process heaters with maximum rated heat input capacities greater than 2 MMBtu/hr and less than 5 MMBtu/hr. Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters establishes NOx emission limits for large water heaters, boilers and process heaters less than or equal to 2 MMBtu/hr. Table 1 summarizes the applicability and NOx emission limits in Rules 1146, 1146.1 and 1146.2.

The proposed amendments in Rules 1146, 1146.1 and 1146.2 initiate the transition of the NOx RECLAIM program to a command-and-control regulatory structure. Proposed Rule 1100 - Implementation Schedule for NOx Facilities (PR 1100) establishes the compliance schedule for facilities exiting the RECLAIM program. The compliance schedule for Proposed Amended Rules 1146 and 1146.1 is staged over a two-year period taking into consideration equipment size range and the number of units at a facility. Also taken into consideration within the compliance schedule are facilities with multiple units subject to multiple source-specific landing rules. There are approximately 111 RECLAIM facilities that will be affected by the proposed amendments. The proposed rule amendments are estimated to reduce 0.23 tons per day of NOx by January 1, 2022.

Table 1 – Applicability and Emission Limits of Rules 1146, 1146.1 and 1146.2

Rule	Applicability	Size	Summary of NOx Emission Limits
Rule 1146	Boilers, steam generators, and process heaters	≥ 5 MMBtu/hr	• 5 ppm for units burning natural gas ≥ 75 MMBtu/hr; • 9 ppm for units burning gaseous fuels 5 to 75 MMBtu/hr
Rule 1146.1	Boilers, steam generators, and process heaters	>2 and <5 MMBtu/hr	• 9-12 ppm for units burning natural gas
Rule 1146.2	Natural gas-fired water heaters, boilers, and process heaters	≤ 2 MMBtu/hr	• Manufacturer limit of 20 ppm; • End-user limit of 30 ppm

PUBLIC PROCESS AND OUTREACH EFFORTS

Development of Proposed Amended Rules 1146, 1146.1 and 1146.2 (PARs 1146 Series) and PR 1100 is being conducted through a public process. SCAQMD staff has held two working group meetings at SCAQMD Headquarters in Diamond Bar on November 30, 2017 and January 16, 2018. The Working Group is composed of representatives from the manufacturers, trade organizations, permit stakeholders, businesses, environmental groups, public agencies, consultants and other interested parties. The purpose of the working group meetings are to discuss proposed concepts and to work through the details of staff's proposal. A Public Workshop is scheduled for February 14, 2018.

In addition to the PARs 1146, 1146.1, 1146.2, and PR 1100 Working Group Meetings, staff has also discussed concepts for the proposed rules at the RECLAIM Working Group meetings on July 13, 2017, September 14, 2017, October 12, 2017, and January 11, 2018.

Staff has also had individual meetings with stakeholders who will be impacted by this rulemaking.

BARCT ASSESSMENT

The California Clean Air Act (CCAA) requires 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 §§40913, 40914, and 40920.5. The required use of *Best Available Retrofit Control Technology* (BARCT) for existing stationary sources is one of the specified feasible measures. Health & Safety Code §40406 defines BARCT as:

> *an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.*

In September 2008, Rules 1146 and 1146.1 were amended to reduce the allowable NOx emission limits from boilers based on rated heat input capacity. Group I includes any unit burning natural gas, excluding digester and landfill gases, with a rated heat input greater than or equal to 75 MMBtu/hr, excluding thermal fluid heaters (Rule 1146(b)(8)). Group II includes any unit burning gaseous fuels, excluding digester and landfill gases, with a rated heat input less than 75 MMBtu/hr down to and including 20 MMBtu/hr, excluding thermal fluid heaters (Rule 1146(b)(9)). Group III includes units burning gaseous fuels, excluding digester and landfill gases, and thermal fluid heaters[1] with a rated heat input less than 20 MMBtu/hr down to and including 5 MMBtu/hr, and all units operated at schools and universities greater than or equal to 5 MMBtu/hr (Rule 1146(b)(10)). Under the 2008 amendment of Rules 1146 and 1146.1, approximately 1,600 units were required to comply with the 9 ppm (0.011 lbs/10^6 Btu) NOx limit by January 1, 2012 through January 1, 2015. The applicable compliance date depended on the unit's rated heat capacity, number of units at the facility, and type of service (e.g., supplying steam at a university). These units include those regulated under Rule 1146.1, Rule 1146-Group III and Rule 1146-Group II. In addition, Rule 1146-Group I units were required to meet a lower emission limit of 5 ppm. To assess the advancement in control technology for the source categories subject to the proposed amended rules and to ensure the proposed amendments address BARCT requirements, staff has reviewed the commercially available NOx reduction technology for boilers, steam generators, and process heaters. A summary of staff's analysis of commercially available NOx reduction technologies for boilers, steam generators, and process heaters is provided below.

Commercially Available Control Technology

For gaseous fuels, thermal NOx is generally the largest contributor of NOx emissions. High flame temperatures trigger the disassociation of nitrogen molecules from combustion air and a chain reaction with oxygen follows to form oxides of nitrogen. Factors that minimize the formation of thermal NOx include reduced flame temperature, shortened residence time, and an increased fuel to air ratio. To reduce NOx emissions, combustion parameters can be optimized, control techniques can be applied downstream of the combustion zone, or a combination of the two approaches can be utilized. Common types of combustion modification include: lowered flame temperature; reduced residence

[1] A Thermal fluid heater means a process heater in which a process is heated indirectly by a heated fluid other than water.

time at high combustion temperature; and reduced oxygen concentration in the high temperature zone.

Ultra Low-NOx Burner Systems

Ultra low NOx burner systems come in a variety of configurations and burner types. Often, fuel and air are pre-mixed prior to combustion. This results in a lower and more uniform flame temperature. Some premix burners also use staged combustion with 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. These burners can also be designed to spread flames over a larger area to reduce hot spots and lower NOx emissions. Radiant premix burners with ceramic, sintered metal or metal fiber heads spread the flame and produce more radiant heat. When a burner produces more radiant heat, it results in less heat escaping the boiler through the exhaust gases.

Most premix burners require the aid of a blower to mix the fuel with air before combustion takes place (primary air). A commonly used application in combination with these burners is flue gas recirculation (FGR). FGR recycles a portion of the exhaust stream back into the burner. Increasing the amount of primary air and/or use of FGR can reduce flame temperature but it also reduces the temperature of combustion gases through dilution and can reduce efficiency. To maintain efficiency a manufacturer may have to add surface area to the heat exchanger. Increasing the primary air may also destabilize the flame. Ultra low NOx burners require sophisticated controls to maintain emissions levels and efficiency, to stabilize the flame, and to maintain a turndown ratio that is sufficient for the demands of the particular operation.

It was noted in the 2008 Rule 1146 and 1146.1 staff reports that there was clear evidence that these types of burners had been successfully retrofitted on boilers and heaters in the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) in their Rule 4306. Source tests conducted in conjunction with Rule 4306 showed a 98% compliance rate with 9 ppm NOx limits using ultra low NOx burners. In 2010, staff published a technology assessment report discussing the implementation assessment on ultra low NOx burners subject to Rules 1146 and 1146.1. The report demonstrated that the 9 ppm limit can be achieved by ultra low NOx burner systems for boilers and process heaters. There were ultra low NOx burner from 16 different manufacturers that could achieve the 9 ppm NOx compliance limit.

Selected Catalytic Reduction (SCR)

SCR – a post-combustion control equipment – is a commercially available technology commonly employed to control NOx emissions from boilers. It is considered to be BARCT, if cost-effective, for NOx control of existing combustion sources such as boilers

and process heaters. A typical SCR system design consists of an ammonia storage tank, ammonia vaporization and injection equipment, a booster fan for the flue gas exhaust, an SCR reactor with catalyst, an exhaust stack plus ancillary electronic instrumentation and operations control equipment. The technology uses a precious metal catalyst that selectively reduces NOx in the presence of ammonia. Ammonia is injected in the flue gas stream where it reacts with NOx and oxygen in the presence of the catalyst to produce nitrogen and water vapor. The typical operating temperature of the exhaust gas is between 450 and 850 degrees F.

For conventional SCRs, the minimum temperature for NOx reduction is 500 degree F and the maximum operating temperature for the catalyst is 800 degree F. Depending on the application, the type of fuel combusted, and the presence of sulfur compounds in the exhaust gas, the optimum flue gas temperature of an SCR system is case-by-case and will range between 550 degree F and 750 degree F to limit the occurrence of several undesirable side reactions at certain conditions. One of the major concerns with the SCR process is the poisoning of the catalyst due to the presence of sulfur and the oxidation of sulfur dioxide (SO_2) in the exhaust gas to sulfur trioxide (SO_3) and the subsequent reaction between SO_3 and ammonia to form ammonium bisulfate or ammonium sulfate. The formation of either ammonium bisulfate or ammonium sulfate depends on the amount of SO_3 and ammonia present in the flue gas and can cause equipment plugging downstream of the catalyst. The presence of particulates, heavy metals and silica in the flue gas exhaust can also limit catalyst performance. However, minimizing the quantity of injected ammonia and maintaining the ammonia temperature within a predetermined range will help avoid these undesirable reactions while minimizing the production of unreacted ammonia which is commonly referred to as "ammonia slip." Depending on the type of combustion equipment utilizing SCR technology, the typical amount of ammonia slip can vary between less than five ppmv when the catalyst is fresh and 20 ppmv at the end of the catalyst life. In addition to the conventional SCR catalysts, there are high temperature SCR catalysts that can withstand temperatures up to 1200 degree F and low temperature SCR catalysts that can operate below 500 degree F.

Based on the 2008 staff reports for Rule 1146 and 1146.1, SCR as applied to Rule 1146 boilers can achieve NOx concentrations from 5 to 6 ppm for units greater than or equal to 75 MMBtu/hr. This appears to be the most effective and cost-effective alternative for this subcategory of Rule 1146 units.

Potential Technologies

The section below summarizes an emerging technology that may have the potential to reduce NOx emissions for this source category.

ClearSign Technology

ClearSign Combustion Corporation in Seattle has developed two technologies applicable for boilers and heaters: DUPLEX™ technology and Electrodynamic Combustion Control (ECC™). DUPLEX™ technology can be installed in new boilers or heaters, or retrofit in existing boilers and heaters. The DUPLEX technology comprises a proprietary DUPLEX tile installed downstream of conventional burners. The hot combustion flame from the conventional burners impinges onto the DULEX tile, and the tile helps radiate heat evenly with high emissivity to the combustion products. DUPLEX operation also creates more mixing and shorter flames. Since the flame length is one parameter that limits the total heat release in a furnace, decreased flame length can allow for significantly higher process throughputs. DUPLEX tile is expected to have a 3- to 5-year life. The Electrodynamic Combustion Control (ECC™) uses an electric field to effectively shape the flame, accelerate flame speed, and improve flame stability. The total electrical field power required to generate such effects is less than 0.1% of the firing rate. Bench test performance estimates for DUPLEX and ECC indicated that NOx and CO were less than 5 ppmv, when furnace temperatures were steady maintained between 1200 and 1800^{o}F.

In San Joaquin Valley, this technology has been installed in two small refinery heaters, three oilfield steam generators and six enclosed flares. While it is a promising technology, it was recommended that more testing/demonstration would be needed before sustainability / durability is proven.[2]

Analysis of NOx Concentration Limits for Rules 1146 & 1146.1 Equipment

To catch all the improvements in innovative control technologies, the SCAQMD compared the requirements in the PAR 1146 Series with the analogous rules adopted by four other air districts in California. The four air districts were San Joaquin Valley, Sacramento Metropolitan, Ventura, and Bay Area. They are selected based on the severity of their nonattainment status for O_3 and PM2.5 federal air quality standards.

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

SJVUAPCD Rules 4306 and 4320 apply to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 MMBtu/hr. SJVUAPCD Rule 4320 limits NOx emissions from units with greater than 20 MMBtu/hr input rating to 7 ppm (or 5 ppm for compliance at a later date). For units with greater than 5 MMBtu/hr input rating to and including 20 MMBtu/hr, emission limit was set at 9 ppm (or 6 ppm for compliance at a later date). Depending on the equipment size and selected NOx limit, the proposed compliance date extends from January 1, 2011 to January 1, 2015.

[2] "Clearsign Ultra Low NOx Technology", San Joaquin Valley APCD, November 7-8 2017.

SJVAPCD has a more stringent limit than SCAQMD rules for the subcategory between 20 and 75 MMBTu/hr (7 ppm in SJVAPCD Rule 4320 vs. 9 ppm in SCAQMD Rule 1146). It is important to note that that for SJVUAPCD's Rules 4306 and 4320, the owner or operator has the option of paying into an annual emissions fee in lieu of complying with the limits. Also, for units ≥ 75 MMBtu/hr, emission limit in SCAQMD Rule 1146 (5 ppm) is more stringent than SJVAPCD's limit of 7 ppm.

- Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 411 NOx from Boilers, Process Heaters and Steam Generators

SMAQMD Rule 411 establishes NOx emission limits boilers greater than or equal to 1 MMBtu/hr. The emission limits range from 15 to 30 ppm for units of 1 up to and including 20 MMBtu/hr, depending on equipment size and operation. For units greater than 20 MMBtu/hr, the limit is 9 ppm.

- Ventura County Air Pollution Control District (VCAPCD) Rule 74.15 Boilers, Steam Generators and Process Heaters (5 MMBtu and greater) and Rule 74.15.1 Boilers, Steam Generators and Process Heaters (1 to 5 MMBtu)

VCAPCD Rule 74.15 establishes a NOx emission limit of 40 ppm for boilers greater than or equal to 5 MMBtu/hr. For natural gas fired units greater than 2 and less than 5 MMBtu/hr, emission limits range from 9 to 12 ppm in Rule 74.15.1. The same rule requires units equal to or greater than 1 and less than or equal to 2 MMBtu/hr to limits their NOx emissions to 20 ppmv.

- Bay Area Air Quality Management District (BAAQMD) Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters)

BAAQMD Reg 9 Rule 7 establishes NOx emission limits for boilers greater than 2 MMBtu/hr. The emission limits range from 15 to 30 ppm for units of 2 to and including 20 MMBtu/hr, depending on equipment size and operation. For units greater than 20 MMBtu/hr and less than 75 MMBtu/hr, the limit is 9 ppm. The emission limit is 5 ppm for units greater than or equal to 75 MMBtu/hr.

Summary of Assessment for Rule 1146 & 1146.1

As part of reviewing the type of technology available to control NOx emissions applicable to the boilers, steam generators and process heaters subject to Rule 1146 and 1146.1, SCR and ultra low-NOx burners are still the main technologies to achieve NOx concentration limits specified in these rules. Although some potential technologies show preliminary success in achieving NOx emissions similar to or less than 5 ppm, the applications are limited. More studies need to be done to demonstrate the readiness for these potential technologies in various non-refinery industries and a wider range of operating conditions.

In addition, staff evaluated rules in other California Air Districts that are regulating the same equipment, and have not found any new commercially available control technology that could be used to further lower the NOx concentration limits as currently adopted in Rules 1146 and 1146.1. EPA also concluded in 2014 that Rule 1146 and Rule 1146.1 are as stringent as other California District rules for this category. Therefore, it is concluded that the NOx emission limits as currently required in Rule 1146 and 1146.1 still represent BARCT at the time of the proposed amendments, and no new BARCT is proposed to the NOx concentration limit in Rules 1146 and 1146.1.

Rule 1146.2

Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers was adopted on January 9, 1998. Rule 1146.2 established NOx emission limits for large water heaters and small boilers with a rating of less than 2 MMBtu/hr. SCAQMD has developed a certification program (Rule 1146.2 Certification Program) through which manufacturers submit documentation, including source test reports, to SCAQMD to demonstrate compliance with Rule 1146.2 emission limits. Rule 1146.2 does not regulate residential gas-fired tank type water heaters less than 75,000 Btu/hour heat input which are regulated under SCAQMD Rule 1121. Units used in recreational vehicles, mobile homes, or RECLAIM facilities are also exempt from the requirements of Rule 1146.2. The 1998 adoption of Rule 1146.2 established NOx emission limits for large water heaters and small boilers ranging from 75,000 Btu/hr up to and including 2 MMBtu/hr. New water heaters or boilers greater than 0.4 MMBtu/hr and less than or equal to 2 MMBtu/hr (Type 2) were required to meet an emission limit of 30 ppm of NOx and 400 ppm of CO. New units from 75,000 Btu/hr to 0.4 MMBtu/hr (Type 1) were required to meet a NOx emission limit of 55 ppm or 40 ng/Joule of heat output. Compliance dates for emission limitations were based on the date of equipment manufacture.

Rule 1146.2 was amended by the SCAQMD Governing Board at the January 7, 2005 hearing. Under the amended rule, compliance dates for existing in-use equipment were delayed until a specific unit is 15 years old. The delayed compliance dates for retrofit of existing equipment resulted in fewer emission reductions from 2005 to 2014 compared with the original adopted rule. Lower emissions limits for new equipment were not considered for the January 7, 2005 rule amendment because additional time was needed to evaluate low NOx technology and cost effectiveness.

Rule 1146.2 was amended again in May 2006 to address NOx emission limits for new equipment. With the exception for small pool heaters rated less than or equal to 400,000 Btu/hour, new manufactured units greater than 400,000 Btu/hr must meet a NOx emission limit of 20 ppm starting January 1, 2010. Most new manufactured units less than or equal to 400,000 Btu/hr must meet a 20 ppm (less than 14 ng/Joule heat output) NOx limit by

January 1, 2012. Pool heaters rated less than or equal to 400,000 Btu/hr, will continue to meet the existing limit of 55 ppm (or 40 ng/Joule heat output). The cost effectiveness for meeting a 20 ppm NOx limit averaged $2,400 per ton for Type 2 units and up to $16,000 per ton for Type 1 units less than or equal to 400,000 Btu/hr.

As part of the technology assessment under the 2006 amendment, source test reports conducted for the Rule 1146.2 Certification Program were analyzed to assess the advancement in control technology. It was found that low NOx burners for boilers and heaters in this size range can achieve less than 10 ppm NOx (at 3% oxygen). In particular, about 15% of the Type 2 units (more than 400,000 Btu/hr) had a certification level of less than 10 ppm of NOx, indicating that Type 2 units are capable of meeting a lower emission level at 12 ppm. Although a lower NOx emission limit was technically feasible at the time of the 2006 amendment, the average cost effectiveness for the 12 ppm emission limit was $24,100, which was considerably higher than the then-proposed emission limit of 20 ppm (average cost effectiveness = $2,400). Due to the relatively high cost of implementing the 12 ppm emission limit for Type 2 units, the 20 ppm emission limit was proposed and adopted in the 2006 amendment.

Analysis of NOx Concentration Limits for Rule 1146.2

To evaluate for potential BARCT advancement from the 2006 amendment, staff has evaluated the following analogues rules in other California Air Districts:

- SJVUAPCD Rule 4308 Boilers, Steam Generators, and Process Heaters – 0.075 MMBtu/hr to Less Than 2.0 MMBtu/hr
- SMAQMD Rule 411 NOx from Boilers, Process Heaters and Steam Generators
- SMAQMD Rule 414 Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu Per Hour
- VCAPCD Rule 74.15.1 Boilers, Steam Generators and Process Heaters 1 to 5 MMBTUs
- VCAPCD Rule 74.11.1 Large Water Heaters and Small Boilers
- BAAQMD Regulation 9 Rule 6 Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters

SCAQMD staff evaluated the requirements contained within the analogues rules and found no requirements that were more stringent than those already in Rule 1146.2.

Summary of Assessment for Rule 1146.2

Based on the above information, there is potential opportunity to lower the NOx concentration emission limit for Rule 1146.2. However, amending NOx concentration limit

will affect both RECLAIM and non-RECLAIM sources, and requires a more extensive rulemaking process. Since a major objective is to initiate the transition of RECLAIM facilities into a command-and-control regulatory structure with highest priority given to older, higher polluting units that will need to install retrofit controls, staff is not proposing changes to the NOx concentration limit for Rule 1146.2 equipment at this time. Staff commits to return to Rule 1146.2 to further assess the advancement and the cost effectiveness of advanced control technologies in this source category. To avoid the need to install an intermediate technology that would be obsolete upon future amendment to Rule 1146.2, it is recommended that RECLAIM facilities with Rule 1146.2 equipment can exit RECLAIM, but will not be subject to the end-user limit of 30 ppm upon exit. In addition, non-RECLAIM facilities currently register Rule 1146.2 equipment from 1 up to and including 2 MMBtu/hr under Rule 222. RECLAIM facilities are exempt from this provision. To aid the assessment of baseline emissions in future rulemaking, PAR 1146.2 includes a provision to require RECLAIM facilities to submit a one-time inventory of Rule 1146.2 Type II units (> 400,000 Btu/hr up to and including 2 MMBtu/hr).

MONITORING, REPORTING AND RECORDKEEPING REQUIREMENTS

In RECLAIM, each pound of NOx emissions is represented by one pound of a NOx RECLAIM Trading Credits (RTCs). A facility must have adequate RTCs to cover or reconcile its quarterly and annual emissions. In other words, mass emissions reported by each facility are used to track and demonstrate compliance. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements, as specified in Rule 2012 *Requirements for Monitoring, Reporting and Recordkeeping for Oxides of Nitrogen Emissions.* RECLAIM MRR requirements are developed to accurately determine mass emissions of NOx for each facility, which is necessary for emission reconciliation and compliance demonstration in the cap-and-trade regulatory structure. RECLAIM MRR requirements are segregated by device classifications. The 4 major device classifications are major sources, large sources, process units, and Rule 219 exempt equipment.

In a command-and-control regulatory structure, a device level-emission standard (expressed in concentration such as ppm in Rules 1146, 1146.1 and 1146.2) is used for regulatory and compliance demonstration. Staff has analyzed the MRR requirements in RECLAIM and Rule 1146 Series. Comparisons between the MRR requirements in RECLAIM and Rule 1146 Series of (a) source testing, (b) tune up / emission check, (c) reporting, (d), recordkeeping, and (e) missing data procedures are presented in Tables 2a-e, respectively.

Table 2(a) – Source Testing Requirements

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	**Rule 1146 Series**		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	Continuous Emissions Monitoring System (CEMS) – Annual (or semi-annual#) certification of Relative Accuracy Test Audits (RATA) including source testing	
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	Source testing once every 3 years;	Source testing once every 3 years for ≥10 and <40 MMBtu/hr; Source testing once every 5 years for ≥5 and <10 MMBtu/hr
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	Source testing once every 5 years for devices with concentration limit	Source testing once every 5 years;
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	Not applicable	Not applicable

* Refer to Rule 2012 for specific definitions
# Only applicable to RECLAIM facilities with standards exceeding the 7.5% requirements

Table 2(b) – Tune Up / Emission Check Requirements

Equipment Type		RECLAIM Tune Up Frequency	Rule 1146 Series Diagnostic Emission Check Frequency
RECLAIM	**Rule 1146 Series**		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	Daily calibration and semi-annual tune ups OR Annual RATA	Not required for units with CEMS
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	Semi-annual tune ups	At least monthly or every 750 operating hours, or quarterly or every 2000 operating hours
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	Annual tune ups	At least quarterly or every 2000 operating hours or semi-annually or every 4000 operating hours
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	Not applicable	Not applicable

* Refer to Rule 2012 for specific definitions

Table 2(c) – Reporting Requirements

Equipment Type		RECLAIM		Rule 1146 Series
RECLAIM	**Rule 1146 Series**	**Electronic**	**Paper**	
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	Daily automatic reporting	Quarterly Certification of Emissions Report and Annual Permit Emissions Program	Every 6 months (Rule 218)
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	Monthly reporting		None
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	Quarterly reporting		None
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	Quarterly reporting		None

* Refer to Rule 2012 for specific definitions

Table 2(d) – Recordkeeping Requirements

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	**Rule 1146 Series**		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	• < 15-min. data = min. 48 hours • ≥ 15-min. data = 3 years (5 years if Title V) • Maintenance & emission records, source test reports, RATA reports, audit reports and fuel meter calibration records for Annual Permit Emissions Program = 3 years (5 years if Title V)	• Source test records • Maintenance & emission records = 2 years • Monitoring data = 2 years (5 years if Title V)
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr		• Source test records • Monitoring data = 2 years (5 years if Title V)
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr		• Source test records = 2 years (5 years if Title V) • Monitoring data = 2 years (5 years if Title V)
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	• Fuel usage records	• Fuel usage records

* Refer to Rule 2012 for specific definitions

Table 2(e) – Missing Data Procedures

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	Rule 1146 Series		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	For >95% availability (short gaps) • use avg. valid hour before and after or use highest hourly NOx conc. for last 30 days For <95% availability (longer gaps) • use highest hourly NOx conc. or last 30 days, or 365 days For <90% availability • use lifetime highest hourly NOx conc.	Not applicable
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	If missing data is < 1 month • use average monthly for the previous 12 months. If missing data is > 1 month • use highest monthly fuel usage for the previous 12 months. If missing data is > 2 months or no records are available • assume 24 hours operation at maximum rated capacity at an uncontrolled emission factor	Not applicable
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	If missing data is < 1 quarter • use average quarterly fuel usage for the previous 4 quarters. If missing data is > 1 quarter • use source's highest quarterly fuel usage for the previous 4 quarters. If no records are available • assume 24 hours operation at maximum rated capacity at an uncontrolled emission factor	Not applicable
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr		

Staff Recommendations

For facilities that transition from RECLAIM to a command-and-control regulatory structure, their MRR requirements are subject to change. Below are staff recommendations on the MRR requirements for facilities exiting the RECLAIM program:

Non-Major Sources in Non-Title V Facilities

The requirements in monitoring and recordkeeping are comparable between RECLAIM and those specified in Rule 1146 series. The reporting requirements are more stringent in RECLAIM, which include both monthly/quarterly electronic reporting, and quarterly and annual paper reporting. The corresponding requirement in Rule 1146 is a semi-annual report for equipment subject to Rule 218. Given the more stringent reporting requirements in RECLAIM were designed to ensure the integrity of the reported mass emissions, the reporting requirements might not be needed if the facilities are subject to Rule 1146 series, which determine compliance through a concentration limit. As such, staff recommends

non-major sources in non-Title V facilities to be subject to the MRR requirements in Rule 1146 series.

Major Sources in Non-Title V Facilities

Major sources in the RECLAIM program are required to be equipped with a Continuous Emission Monitoring System (CEMS). Major source is defined in Rule 2012 (c)(1) as follows:

> (A) any boiler, furnace, oven, dryer, heater, incinerator, test cell and any solid, liquid or gaseous fueled equipment with a maximum rated capacity:
>
> (i) greater than or equal to 40 but less than 500 million Btu per hour and an annual heat input greater than 90 billion Btu per year; or
>
> (ii) 500 million Btu per hour or more irrespective of annual heat input;

In Rule 1146 Series, any units with a rated heat input capacity greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 x 10^9 Btu per year are required to install continuous in-stack NOx monitor (CEMS-equivalent) (Rule 1146 (c)(6)).

Since the applicability threshold in annual heat input is lower in RECLAIM, it is possible that an equipment required to maintain a CEMS under RECLAIM Rule 2012 might not be required to maintain the CEMS when it is subject to Rule 1146. The use of a continuous in-stack monitor is a significant part of monitoring, and removing it may raise concerns on potential backsliding. As such, staff recommends that major sources in non-Title V facilities to maintain their CEMS after the transition.

With respect to other MRR requirements, staff recommends major sources in non-Title V facilities to be subject to the MRR requirements in Rule 1146 series.

Title V Facilities

Title V is a federal program designed to standardize air quality permits and the permitting process for major sources of emissions across the country. Title V requires additional periodic monitoring for the SIP-approved, federally enforceable rules that do not contain sufficient monitoring requirements to assure compliance with the emission limitations or other requirements. Currently, the monitoring requirements in the RECLAIM program are comprehensive and address the Title V periodic monitoring requirements. For non-RECLAIM Title V facilities subject to Rules 1146 series, additional periodic monitoring requirement have been outlined in SCAQMD Periodic Monitoring Guidelines.[3]

Under the Title V program, "relaxation of any monitoring, recordkeeping, or reporting requirement, term, or condition in the Title V permit" is considered a significant revision

[3] Periodic Monitoring Guideline. http://www.aqmd.gov/home/permits/title-v/title-v-requirements#pm.

(Rule 3000(b)(31), and would trigger a public process (Rule 3005(f) and Rule 3006(a)). To avoid the need for an extensive public process triggered by the change in the MRR requirements, staff recommends to maintain the RECLAIM MRR requirements for Title V facilities. In other words, Title V facilities would still be subject to the MRR requirements in RECLAIM after the transition. Staff is committed to work on the MRR requirements for Title V facilities in the RECLAIM program, and address the transition for Title V facilities as soon as practicable.

COMPLIANCE SCHEDULE

Starting March, 2017, a monthly RECLAIM Working Group Meeting has been held to present and solicit information and suggestions from the public regarding the RECLAIM Transition Mechanisms. With the consideration of comments received, staff identified four different pathways to transition facilities out of RECLAIM:

- Source-specific command-and-control rules
- Industry-specific command-and-control rules
- Compliance plans
- Opt-out provisions

As of January 2018, four industry-specific categories have been identified. These four sectors are:

- Electricity Generating Facilities (EGFs)
- Refineries
- Metal Operations Facilities
- Aggregate Facilities

Facilities in these four sectors would be subject to industry-specific command-and-control rules (Rule 1135 for EGFs; Rule 1109.1 for refineries; Rule 1147.1 for metal operations facilities; and Rule 1147.2 for aggregate facilities). Rule 1146 series equipment in EGFs and refineries are subject to requirements to be established in the industry-specific rules. Since they would not follow the implementation schedule established for PAR 1146 series, they are not included in the permit analysis presented in this staff report. While PARs 1146 series establish the NOx emission limits for facilities transitioning out of RECLAIM, the implementation schedule will be described in PR 1100.

Analysis of Rule 1146 and 1146.1 Units Currently Not Meeting NOx Limit

To understand the number and the size of units that need to meet the NOx concentration limits, and to establish the appropriate compliance schedule for facilities, staff analyzed permits for all Rule 1146, 1146.1, and 1146.2 units in RECLAIM to evaluate facilities with multiple pieces of Rule 1146 and 1146.1 equipment and those with both Rule 1146 series and other RECLAIM equipment.

Out of the 266 RECLAIM facilities, 111 facilities were permitted with equipment that will be subject to PARs 1146, 1146.1 or 1146.2. Since RECLAIM facilities with Rule 1146.2 equipment will not be subject to the end-user limit of 30 ppm upon exit, the analysis focused on Rules 1146 and 1146.1. Two hundred and fifty pieces of equipment are subject to Rule 1146, while 69 pieces of equipment are subject to Rule 1146.1. Figure 1 shows the breakdown of the RECLAIM facilities list. Figure 2 shows a pie chart of Rules 1146 and 1146.1 equipment differentiated by their BARCT status.

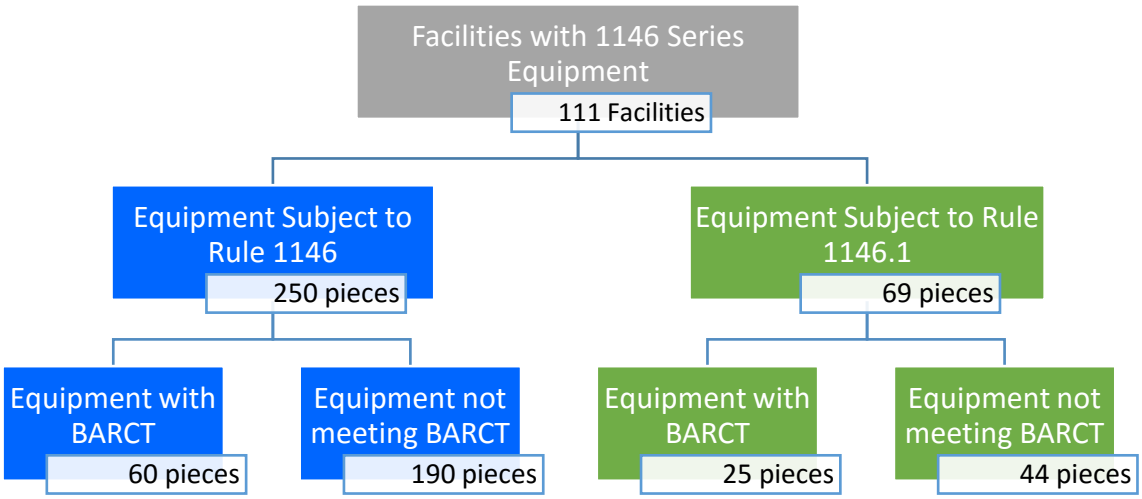

Figure 1 – RECLAIM Facilities with Rule 1146 Series Equipment

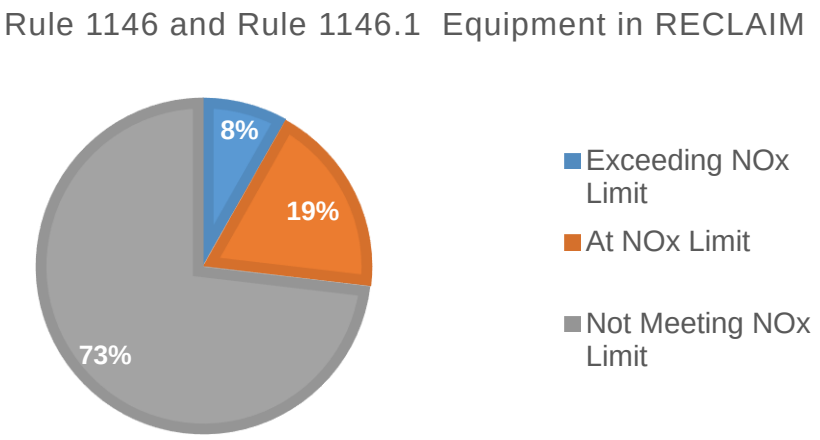

Figure 2 – Rule 1146 and Rule 1146.1 Equipment in RECLAIM

Figure 3 shows the number of units that are currently not meeting the applicable NOx concentration limits in Rules 1146 and 1146.1. Most of the facilities had 1 to 3 pieces of equipment that are currently not meeting the applicable Rule 1146 & Rule 1146.1 limits. Twelve facilities had between 4 and 7 units. Three facilities had 8 or more pieces of equipment that are not currently meeting the applicable Rule 1146 and Rule 1146.1 limits.

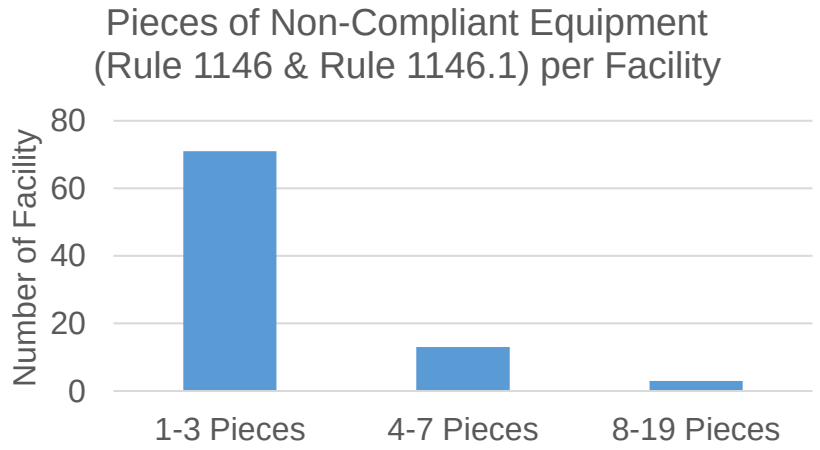

Figure 3 – Non-Compliant Equipment in Facilities Subject to Rules 1146 & 1146.1 Only

When establishing the appropriate compliance schedule, staff took into consideration the compliance schedule of the 2008 amendment of Rules 1146 and 1146.1. In the 2008 amendment, there were about 2100 active permitted units affected by the rule amendments. The impacted facilities were given about 3-5 years to comply with the then-proposed

emission limits. Given the considerably lower number of units that would need to be replaced under the proposed amendments (234 permitted units for Rules 1146 and 1146.1), staff anticipates that similar, if not a shorter timeframe would be reasonable. For facilities with 7 or less units, staff believes they can meet the NO_x concentration limits within 3 years. For facilities with 8 or more pieces of equipment, staff will assess if 3 years is sufficient to meet the NOx concentration limits.

Analysis of Facilities with Rules 1146 and 1146.1 Equipment and Other Landing Rules

Staff has reviewed permits for all Rule 1146, 1146.1, and 1146.2 units in RECLAIM, and identified the number of non-Rule 1146 and 1146.1 units a facility has. As illustrated in Figure 4, about half of facilities had 3 or less non-Rule 1146 and 1146.1 units[4] ("other units"). Most of these equipment are subject to Rule 1110.2 (*Emissions from Gaseous - and Liquid-Fueled Engines*) or Rule 1147 units (*NOx Reductions from Miscellaneous Sources*), which is scheduled to be amended in summer 2018 and in 2019 respectively. Twenty-six facilities had 4 to 10 other units. Staff believes that facilities with 10 or less other units can meet the NO_x concentration limits for Rule 1146 and/or Rule 1146.1 within three years. There is a total of 14 facilities that had more than 10 other units. Staff is further assessing the compliance schedule for the facilities with more than 10 other units. Staff will evaluate each facility individually, and determine whether it is feasible to address the Rule 1146 series equipment within the 3 year timeframe, while these 14 facilities also have to address more than 10 other units. Also, in the interest of achieving greater emission reductions early, staff will look at the emissions for each source category and develop a schedule that would allow facilities to address higher emitting equipment first.

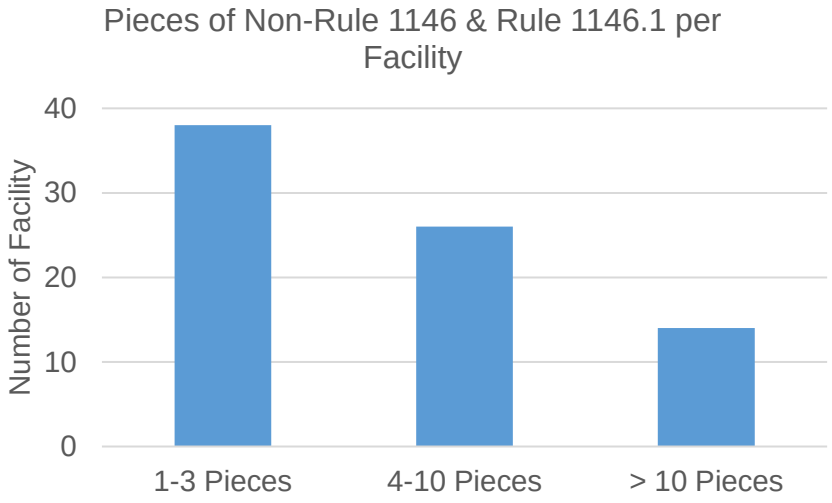

Figure 4 – Non-Rule 1146 and Rule 1146.1 Equipment

[4] Excludes Rule 1470 equipment

Equipment by Size

One major goal of PR 1100 is to ensure that facilities affected by multiple landing rules will achieve the greatest emission reductions early, and that facilities will address higher emitting equipment first. In addition to the number of units, the size of the equipment is also taken into consideration when determining the compliance schedule. The distribution of units affected by PARs 1146 and 1146.1 by size range is presented in Table 3.

Table 3
Number of Equipment by Size

Rule Applicability	Meet BARCT	Do Not Meet BARCT
Rule 1146		
Group I (≥ 75 mmBtu/hr)	1	8
Group II (20 to <75 mmBtu/hr	23	64
Group III (5 to < 20 mmBtu/hr)	23	118
Rule 1146.1 (2 to <5 mmBtu/hr)	25	44
Total	**72**	**234**

To focus on larger emission sources having a final implementation sooner, staff proposes to stagger the implementation schedule by rated heat input, an approach that is consistent with the 2008 amendment of Rule 1146 and 1146.1. About 17% of the affected facility has multiple units with rated heat input in different size bins. Instead of setting a different compliance schedule for each size bin, staff is proposing to collapse all groups together (Rule 1146-GroupI, Group II and Group III, and Rule 1146.1) so that facilities will have more flexibility to address larger equipment first.

Initial Recommendation for Compliance Schedule

Based on the above analysis, staff proposes to establish a compliance schedule staggered by rated heat input of the equipment, with 75% of compliance by rated heat input (excluding BARCT-compliance equipment) required for Rules 1146 and 1146.1 units by January 1, 2021, and 100% of compliance by rated heat input required by January 1, 2022. Staff also proposes for facilities to submit a complete permit application by August 1, 2018, which leaves about 29 months for permit approval, unit installation and source testing.

PROPOSED AMENDMENTS TO RULES 1146, 1146.1 AND 1146.2

The proposed amendments will affect Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters;

Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; and Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters.

PAR 1146

Rule 1146 applies to boilers, steam generators, and process heaters of equal to or greater than 5 million BTUs per hour of rated heat input capacity used in all industrial, institutional, and commercial operations with the exception of boilers used by electric utilities to generate electricity (or electricity generating facilities, EGFs), boilers and process heaters with a rated heat input capacity greater than 40 million BTUs per hour that are used in petroleum refineries, sulfur reaction plant boilers, and units operated at RECLAIM facilities pertaining to NOx emissions only.

The proposed amendments would revise the exception in the applicability that is contained in paragraph (a)(4) for:

> *"any RECLAIM facility as defined in Rule 1100 – Implementation Schedule for NOx Facilities, as being subject to an industry-specific category."*

A definition was added for RECLAIM FACILITY in paragraph (b)(19), which means:

> *"a facility that is currently or was in the Regional Clean Air Incentives Market, as established in Regulation XX."*

As facilities in RECLAIM transition to command-and-control, those units that would be subject to Rule 1146 based on equipment type will be required to comply with the current emission limits in the rule (on Table 1146-1), which represent current BARCT. However, the category assignments and associated implementation schedule will specified in Proposed Rule (PR) 1100. Paragraph (c)(1) will state:

> *"The owner or operator of a RECLAIM facility subject to Rule 1100 – Implementation Schedule for NOx Facilities shall comply with the NOx emission limits specified in Table 1146-1 in accordance with the category assignments and schedule specified in Rule 1100."*

Subparagraph (c)(1)(K) that is contained in Table 1146-1 will further specify the emission limits referenced in Table 1146-1 and refer to Rule 1100 for the implementation schedule. The requirements in (c)(2) (Table 1146-2), which specify an enhanced compliance schedule for Group II units, would not apply for a RECLAIM facility subject to Rule 1100. Paragraph (c)(5), which contains provisions for low fuel usage units that have been in operation prior to September 5, 2008, would also apply to units that will be subject to Rule 1100 on the date of adoption. Paragraph (c)(10), which applies to biogas units that are co-

fired with natural gas, would require compliance with the emission limits in Table 1146-1 by January 1, 2022 for units located at a RECLAIM facility and subject to Rule 1100.

Subdivision (d) contains the compliance determination requirements for the equipment subject to this rule. Paragraph (d)(8) provides a clarification that is also contained in the Protocol for the Periodic Monitoring of Nitrogen Oxides, Carbon Monoxide, and Oxygen from Units Subject to South Coast Air Quality Management District Rules 1146 and 1146.1 (Combustion Gas Periodic Monitoring Protocol). The purpose of the clarification is to exclude units that are subject to continuous emission monitoring system (CEMS) requirements from the periodic monitoring requirements (or diagnostic emission checks) contained in Rule 1146. Paragraph (c)(6) contains the continuous emission monitoring requirements and the proposed language in paragraph (d)(8) excludes the units that are subject to CEMS from performing diagnostic emission checks. Subparagraph (d)(8)(A) provides for 6 months after the compliance date specified in Rule 1100 for a RECLAIM facility to conduct periodic monitoring for NOx emissions. Subparagraph (d)(8)(B) would require a RECLAIM facility that is subject to Rule 1100 until January 1, 2022 or after, or during burner replacement, whichever occurs later, to conduct NOx emission checks for low fuel usage units according to the existing tune-up schedule contained in subparagraph (c)(5)(B).

Subdivision (e) contains the compliance schedule provisions and paragraphs (e)(1) and (e)(2) make exceptions to the compliance schedules that currently are listed on Tables 1146-1 and 1146-2 for facilities subject to Rule 1100, since Rule 1100 will contain the implementation schedules for the units that will be transitioning out of the RECLAIM program. Paragraph (e)(3) provides low fuel usage units operated at facilities transitioning out of RECLAIM until January 1, 2022 or during burner replacement, whichever is later, to install a burner meeting the 30 ppm NOx emission level, per subparagraph (c)(1)(A) of Table 1146-1.

PAR 1146.1

Rule 1146.1 applies to boilers, steam generators, and process heaters that are greater than 2 million BTUs per hour and less than 5 million BTUs per hour of rated heat input capacity used in any industrial, institutional or commercial operation with the exception of boilers operated at RECLAIM facilities pertaining to NOx emissions only.

The proposed amendments would revise the exception that is contained in the applicability for:

> *"any RECLAIM facility as defined in Rule 1100 – Implementation Schedule for NOx Facilities, as being subject to an industry-specific category."*

A definition was added for RECLAIM FACILITY in paragraph (b)(14), which means:

> *"a facility that is currently or was in the Regional Clean Air Incentives Market, as established in Regulation XX."*

Paragraph (c)(1) would not require a RECLAIM facility to comply with the 30 ppm NOx emission level, but as facilities in RECLAIM transition to command-and-control, those units would be subject to the NOx emission requirements contained in Table 1146.1-1, which represent current BARCT. However, the category assignments and associated implementation schedule will specified in Proposed Rule (PR) 1100. Paragraph (c)(2) will state:

> *"The owner or operator of a RECLAIM facility subject to Rule 1100 – Implementation Schedule for NOx Facilities shall comply with the NOx emission limits specified in Table 1146.1-1 in accordance with the category assignments and schedule specified in Rule 1100."*

Table 1146.1-1 will further specify the emission limits referenced in that table and refer to Rule 1100 for the implementation schedule. Paragraph (c)(5), which contains provisions for low fuel usage units that have been in operation prior to September 5, 2008, would also apply to units that will be subject to Rule 1100 on the date of adoption. Paragraph (c)(8), which applies to biogas units that are co-fired with natural gas, would require compliance with the emission limits in Table 1146.1-1 by January 1, 2022 for units located at a RECLAIM facility and subject to Rule 1100.

Subdivision (d) contains the compliance determination requirements for the equipment subject to this rule. Subparagraph (d)(7)(A) provides for 6 months after the compliance date specified in Rule 1100 for a RECLAIM facility to conduct periodic monitoring for NOx emissions. Subparagraph (d)(7)(B) would require a RECLAIM facility that is subject to Rule 1100 until January 1, 2022 or after, or during burner replacement, whichever occurs later, to conduct NOx emission checks for low fuel usage units according to the existing tune-up schedule contained in subparagraph (c)(5)(B).

Subdivision (e) contains the compliance schedule provisions and paragraph (e)(1) makes reference to the compliance schedule requirement that is contained in Rule 1100 for a RECLAIM facility, since Rule 1100 will contain the implementation schedule for the units that will be transitioning out of the RECLAIM program. Paragraph (e)(2) provides low fuel usage units operated at facilities transitioning out of RECLAIM until January 1, 2022 or during burner replacement, whichever is later, to install a burner meeting the 30 ppm NOx emission level, per subparagraph (c)(1).

PAR 1146.2

Rule 1146.2 applies to large water heaters and small boilers and process heaters with a rated heat input capacity up to and including 2,000,000 BTUs per hour. There are both manufacturer and end-user requirements contained in the rule.

A definition was added for RECLAIM FACILITY in paragraph (b)(13), which means:

> *"a facility that is currently or was in the Regional Clean Air Incentives Market, as established in Regulation XX."*

Paragraphs (c)(3), (c)(4), and (c)(5) contain end-user requirements for the operation of units subject to the rule. The proposed amendments would make exceptions of these requirements for units that are operated at a RECLAIM facility that transitions to command-and-control. In order to establish a proper inventory of these sources for a subsequent BARCT assessment, the proposed amendments would require the owner of operator of a RECLAIM facility that has a Type 1 or Type II unit (as defined in Rule 1146.2) to provide the Executive Officer with the following information:

(A) The manufacturer, model number, and serial number of each unit;

(B) The maximum heat input rating (expressed in BTU per hour);

(C) The original date of manufacture;

(D) Evidence that the unit has been retrofitted with a low-NOx burner that meets the NOx concentration limits specified in this rule; and

(E) Therms per year for the unit in the previous calendar year

These provisions would be contained in paragraph (c)(13).

Subdivision (h) contains the exemptions to the provisions of this rule. Paragraph (h)(3) contains the exemptions for units operated at RECLAIM facilities. However, since these exemptions are now contained within the specific end-user provisions of subdivision (c), paragraph (h)(3) will be removed.

PROPOSED RULE 1100

In addition, the proposal will introduce requirements for the implementation of BARCT for specific NOx RECLAIM facilities that transition out of the program to command-and-control in Proposed Rule 1100 – Implementation Schedule for NOx facilities.

PR 1100

Proposed Rule 1100 would establish the implementation schedule for Regulation XX NOx RECLAIM facilities that are transitioning to a command-and-control regulatory structure.

PR 1100 would apply to units that would be subject to the emission requirements of PARs 1146 and 1146.1. Definitions for a Rule 1146 unit and a Rule 1146.1 unit are included in PR 1100 that make reference to the definition of boiler and process heater contained in both Rule 1146 and Rule 1146.1. In addition, a definition for Industry-Specific Category has been specified that would list the types of RECLAIM facilities that would not be subject to the requirements of PR 1100. At this time, refineries and electricity generating facilities (EGFs) would not be subject to the command-and-control rules referenced in PR 1100 (Rule 1146 and Rule 1146.1) or the implementation schedule listed in subdivision (d). These types of equipment and all other combustion sources belonging to these industry-specific categories will be addressed in individual command-and-control rules that will contain both the required emission limits and implementation schedule.

Subdivision (d) contains the implementation schedule requirements for boilers and process heaters that will be subject to the emission requirements of Rule 1146 and Rule 1146.1. RECLAIM facilities that do not meet the emission limits of Rule 1146 and Rule 1146.1 would have until August 1, 2018 to submit a complete permit application for retrofits [PR1100 (d)(1)(A)]. RECLAIM facilities retrofitting boilers and process heaters would have until January 1, 2021 to meet the applicable Rule 1146 and Rule 1146.1 emission requirements for at least 75% of the total heat input for the boilers and process heaters at the facility [PR1100 (d)(1)(B)]. The heat input is the equipment rating of the unit, expressed in million BTUs per hour. The final compliance deadline for the remaining units would be January 1, 2022 [PR1100 (d)(1)(C)]. Paragraph (d)(2) contains the command-and-control rule references for the required emission limits of these units.

Paragraph (d)(3) states that RECLAIM facilities that are also in Title V would be required to comply with the monitoring, reporting, and recordkeeping requirements specified in Rule 2012. Paragraph (d)(4) states that any RECLAIM facility that is subject to an industry-specific rule would not be subject to the command-and-control rules referenced in subdivision (d) or the implementation schedule listed in subdivision (d).

AFFECTED INDUSTRIES

The proposed amendments intend to initiate the transition of the NOx RECLAIM program to a command-and-control regulatory structure, and are applicable to facilities exiting the RECLAIM program that would be subject to source-specific command-and-control regulations. Non-RECLAIM sources, as well as RECLAIM facilities that would be subject to sector specific command-and-control regulations, namely EGFs and refineries, would not be impacted by the proposed amendments, and are therefore excluded from this analysis. Among the 266 facilities currently in the NOx RECLAIM program as of

November 2017, an estimated total of 111 facilities would be affected by PARs 1146 Series and PR 1100.

The proposed amendments affect a wide variety of RECLAIM facilities. Staff has estimated that there are about 310 active permitted units in the RECLAIM universe that are affected by this around of rule amendment. Figure 5 shows the types of industry affected by the proposed amendments.

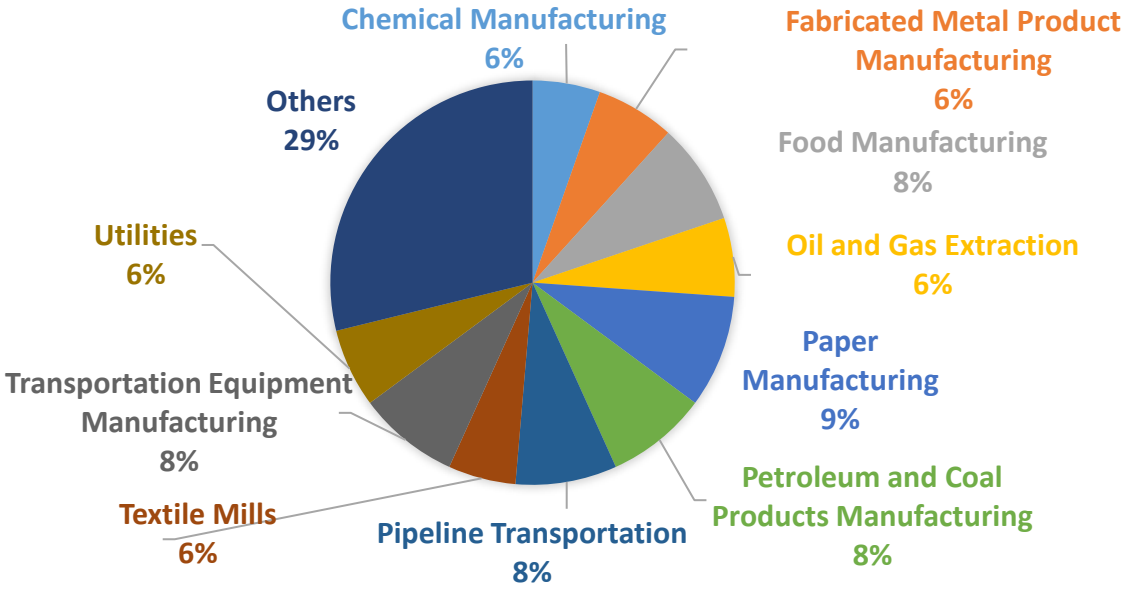

Figure 5 – Industries Affected by Rule 1146

When grouped according to the North American Industry Classification System (NAICS), paper manufacturing is the largest single contributor accounting for 9% of the total. Food manufacturing, petroleum and coal products manufacturing, pipeline transportation, and transportation equipment manufacturing each contributes to about 8% of the total. Next, chemical manufacturing, fabricated metal product manufacturing, oil and gas extraction, textile mills, and utilities each accounts for 5-6 % each. Each single remaining group comprises less than 4% of the total. Remaining NAICS groups include, but are not limited to, primary metal manufacturing, computer and electronic product manufacturing, and textile product mills, and personal and laundry services.

EMISSION REDUCTIONS

The total NOx inventory for the units affected by Rule 1146 and Rule 1146.1 is estimated to be 0.36 tons per day. This estimate is taken from SCAQMD RECLAIM inventory database for calendar year 2016, and excludes facilities that would be subject to sector specific command-and-control regulation namely EGFs and refineries. Emissions for

major sources, as defined in SCAQMD Rule 2012, were extracted from their quarterly certification of emission reports (QCER). Large sources and process units report their mass emissions electronically on a monthly bases, and their monthly mass emissions were included in the analysis. For units with missing data or reports, their emissions were adjusted to full year emissions (i.e. emissions from an equipment with only 3 out of 4 quarterly reports were adjusted up by 33.3%). The NOx emission distribution by the size range are as follows:

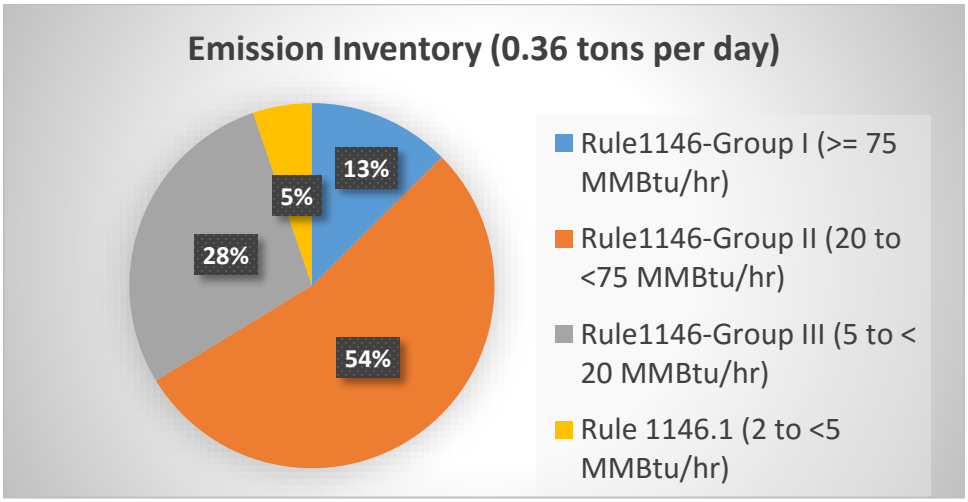

Figure 6 – 2016 Baseline Emissions by Size Rang

As presented in Figure 6, over half of the 2016 baseline emissions were emitted from Group II units (20 to <75 MMBtu/hr). On average, each Group II unit accounted for 0.0023 tpd of NOx emissions. Although Group I unit contributed to 13% of baseline emissions, on average, each Group I unit accounted for more than double the amount of emissions (0.0051 tpd) than a Group II unit (0.0023 tpd). This suggests that to achieve the greatest amount of emission reduction early, equipment with a larger heat input should be addressed first.

Emission reductions were calculated using the difference between the emission factor for the existing permit emission limits and the NOx emission limits for the various categories of boilers and heaters presented in Table 1. Based on this methodology, the proposed rule amendments are estimated to reduce approximately 0.23 tons per day of NOx emissions from RECLAIM facilities regulated under PARs 1146 and 1146.1. The estimated emission reductions by unit size range are presented in Figure 7.

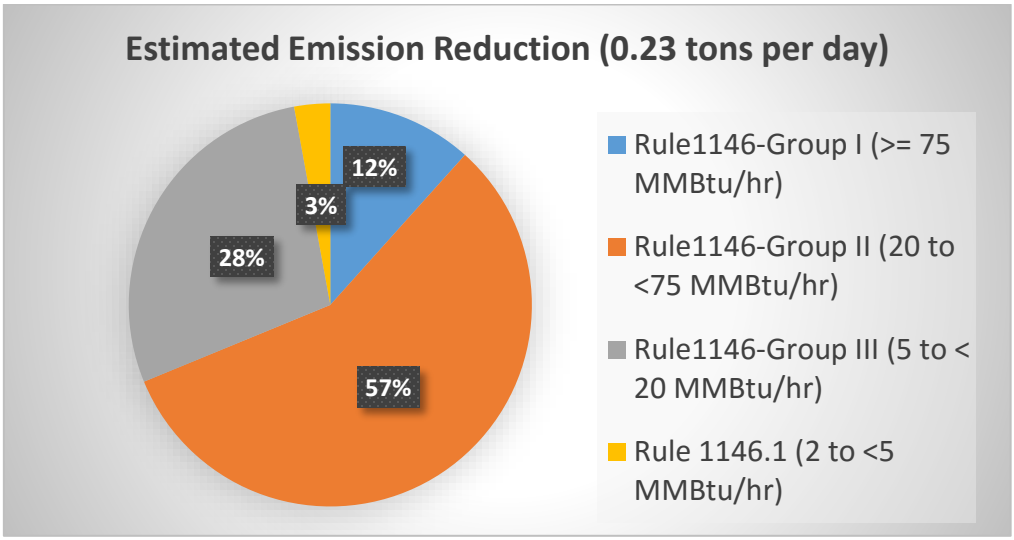

Figure 7 – Emission Reduction by Size Range

TRANSITION LOGISTICS

After amending landing rules of PAR 1146 series and adopting PR 1100, the transition process will be initiated for facilities with equipment subject to the PAR 1146 series only. Facilities with equipment subject to other landing rules that are not ready, such as Rule 1110.2 and Rule 1147, will remain in RECLAIM. The proposed amendments would initiate the transition of RECLAIM facilities into a command-and-control regulatory structure. A facility is ready to transition into command-and-control if:

a) All equipment is at BARCT; or

b) All RECLAIM source equipment meets current command-and-control BARCT rules with implementation schedule specified in PR 1100.

The procedure for the transition can be found in Rule 2002. Rule 2002 contains the notification procedures for facilities that will be transitioned out of RECLAIM and addresses the RTC holdings for these facilities that will be transitioned out of RECLAIM or that elect to exit RECLAIM. Rule 2002 Paragraphs (f)(6) through (f)(9), detail how a facility will be notified regarding the transition.

As a facility is identified to transition out of RECLAIM, the Executive Officer will provide a written letter to notify a RECLAIM facility that it is under review for transition by way of an initial determination notification. This initial notification will also include an existing list of NOx emitting equipment and a request for the owner or operator of the RECLAIM facility to confirm the RECLAIM source equipment at the facility, as well as to identify any NOx emitting equipment that is not subject to permitting requirements (e.g., Rule 219 permit exempt equipment). The RECLAIM facility would be required to provide an

identification of all NOx emission equipment (including equipment that is exempt from permitting) within 45 days of the date of the initial determination notification. The facility can also respond and provide information to the Executive Officer to confirm that it is ready for the transition to command-and-control. If the notified facility, after responding, is deemed as ready to transition into command-and-control after review by the Executive Officer, it will receive a final determination notification that it will be removed from RECLAIM and be subject to command-and-control regulations [proposed paragraph (f)(7)]. If it is determined that a facility is deemed as not ready to exit from RECLAIM and is notified, it will remain in RECLAIM until a subsequent notification and determination is made to exit.

Rule 2002 Paragraph (f)(9) outlines requirements pertaining to RTCs for facilities that are notified for exiting RECLAIM. It states that:

> *"Any RECLAIM facility that receives a final determination notification from the Executive Officer pursuant to paragraph (f)(7) shall not sell or transfer any future compliance year RTCs as of the date specified in the final determination notification and may only sell or transfer current compliance year RTCs until the facility is transitioned out of the RECLAIM program."*

If, after review, a RECLAIM facility receives a final determination notification, then the facility would not be able to sell any future compliance year RTCs after a date certain as specified in the notification, but could only sell that current compliance year RTCs until the facility exits RECLAIM.

As a result of the proposed amendments to Rules 1146, 1146.1 and 1146.2, staff has identified 27 RECLAIM facilities that can be removed from the RECLAIM program. These facilities have permitted NOx emissions solely from a combination of (i) Rule 1146, (ii) Rule 1146.1, and (iii) Rule 1146.2. These 27 facilities would be ready to exit the program once the proposed amendments are adopted. The non-BARCT compliant Rule 1146 and Rule 1146.1 equipment would be subject to the BARCT emission limits specified in the corresponding rules, with the compliance schedule specified in PR 1100. These facilities, once they exit the RECLAIM program, are considered to be regulated under the command-and-control regulatory structure. With the exception of Title V facilities following the MRR requirements in Rule 2012, these 27 facilities would no longer be subject to other requirements in the RECLAIM program.

SOCIOECONOMIC ASSESSMENT

A socioeconomic assessment for PARs 1146 Series and PR 1100 will be conducted and will be available to the public at least 30 days prior to the SCAQMD Governing Board Meeting anticipated for April 6, 2018.

CALIFORNIA ENVIRONMENTAL QUALITY ACT ANALYSIS

PARs 1146, 1146.1 and 1146.2, and PR 1100 are considered a "project" as defined by the California Environmental Quality Act (CEQA), and the SCAQMD is the designated lead agency. Pursuant to CEQA and SCAQMD Rule 110, the SCAQMD, as lead agency for the proposed project, has determined that an Environmental Assessment (EA) will be required for PARs 1146, 1146.1 and 1146.2, and PR 1100. The Draft EA to be prepared will analyze the potential effects that the project may cause on the environment. In the event that the proposed project may have statewide, regional, or area-wide significance, a CEQA scoping meeting is required pursuant to Public Resources Code section 21083.9(a)(2) and will be held concurrently with the Public Workshop for PARs 1146, 1146.1 and 1146.2, and PR 1100. As part of the CEQA Scoping Meeting, SCAQMD staff will solicit input from the public on the CEQA evaluation. The Draft EA, upon its release, will be available for a public review and comment period and will contain responses to the comments made at the CEQA Scoping Meeting and comment letters received relative to the EA.

DRAFT FINDINGS UNDER CALIFORNIA HEALTH AND SAFETY CODE SECTION 40727

Requirements to Make Findings

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.

Necessity

PARs 1146, 1146.1 and 1146.2, and PR 1100 are needed to establish BARCT requirements for facilities that will be transitioning from RECLAIM to a command-and-control regulatory structure.

Authority

The SCAQMD obtains its authority to adopt, amend, or repeal rules and regulations pursuant to California Health and Safety Code Sections 39002, 39616, 40000, 40001, 40440, 40702, 40725 through 40728, and 41508.

Clarity

PARs 1146, 1146.1 and 1146.2, and PR 1100 are written or displayed so that its meaning can be easily understood by the persons directly affected by it.

Consistency

PARs 1146, 1146.1 and 1146.2, and PR 1100 are in harmony with and not in conflict with or contradictory to, existing statutes, court decisions or state or federal regulations.

Non-Duplication

PARs 1146, 1146.1 and 1146.2, and PR 1100 will not impose the same requirements as any existing state or federal regulations. The proposed amended rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the SCAQMD.

Reference

In amending these rules, the following statutes 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

H&SC Section 40727.2 requires an incremental cost effectiveness analysis of the proposed rule requirements. The incremental cost effectiveness analysis will be conducted and released in the draft staff report at least 30 days prior to the SCAQMD Governing Board Hearing on PAR 1146 series and PR 1100, which is anticipated to be heard on April 6, 2018.

COMPARATIVE ANALYSIS

Under H&SC 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. See Table 4 below.

Table 4 – Comparative Analysis

Rule Element	PAR 1146	PAR1146.1	PAR1146.2	RECLAIM	Equivalent Federal Regulation
Applicability	Boilers, steam generators, and process heaters with maximum rated heat input capacities greater than or equal to 5 MMBtu/hr	Boilers, steam generators, and process heaters with maximum rated heat input capacities greater than 2 MMBtu/hr and less than 5 MMBtu/hr	Large water heaters, boilers and process heaters less than or equal to 2 MMBtu/hr	Facilities regulated under the NOx RECLAIM program (SCAQMD Reg. XX)	None
Requirements	NOx limits: • Digester gas: 15 ppmv • Landfill gas: 25 ppmv • Refinery gas: 30 ppmv For other types of fuels: 5 ppmv for ≥75 MMbtu/hr, natural gas; 30 ppmv for ≥75 MMbtu/hr, other fuels; and 5 or 9 ppmv for 20–75 MMbtu/hr units CO limit: 400ppmv	Atmospheric Units: 12 ppmv • Digester gas: 15 ppmv • Landfill gas: 25 ppmv • All others: 9 ppmv CO limit: 400 ppmv.	NOx limit is 20 ppmv for units less than 2 mmbtu/hr.	For refinery gas: 2 ppmv for units > 40 MMbtu/hr For other units: 9 ppmv for units > 20 MMbtu/hr; and 12 ppmv for units ≥ 2 MMbtu/hr	None
Reporting	Every 6 months for units greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 x 10^9 Btu per year (Rule 218)	None	None	• Daily electronic reporting for major sources • Monthly to quarterly reporting for large sources and process units • Quarterly Certification of Emissions Report and Annual Permit Emissions Program for all units	None
Monitoring	• A continuous in-stack NOx monitor for units greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 x 10^9 Btu per year • Source testing once every 3 – 5 years for other units	• Source testing once every 5 years	None	• A continuous in-stack NOx monitor for major sources • Source testing once every 3 years for large sources •Source testing once every 5 years for process units	None
Recordkeeping	• Source test records • Maintenance & emission records = 2 years • Monitoring data = 2 years (5 years if Title V)	• Source test records = 2 years (5 years if Title V) • Monitoring data = 2 years (5 years if Title V)	None	• < 15-min. data = min. 48 hours; • ≥ 15-min. data = 3 years (5 years if Title V) • Maintenance & emission records, source test reports, RATA reports, audit reports and fuel meter calibration records for Annual Permit Emissions Program = 3 years (5 years if Title V)	None