

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

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 NO_x Facilities

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EXECUTIVE SUMMARY

Control Measure CMB-05 of the Final 2016 Air Quality Management Plan (AQMP) included a five tons per day NO_x emission reduction as soon as feasible but no later than 2025, and to transition the Regional Clean Air Incentives Market (RECLAIM) program to a command-and-control regulatory structure requiring Best Available Retrofit Control Technology (BARCT) as soon as practicable. California State Assembly Bill 617, approved by the Governor on July 26, 2017, requires Air Districts to develop, by January 1, 2019, an expedited schedule for the implementation of BARCT no later than December 31, 2023 for facilities that are in the state greenhouse gas cap and trade program.

The RECLAIM program, which is under Regulation XX, was adopted in October 1993 and is a market-based emissions trading program designed to reduce NO_x and SO_x emissions. Proposed Amended Rules 1146, 1146.1 and 1146.2 update NO_x emission limits for boilers, heaters, and steam generators. The revised NO_x emission limits represent BARCT and apply to RECLAIM and non-RECLAIM facilities. Proposed Rule 1100 – Implementation Schedule for NO_x Facilities (PR 1100) establishes the compliance schedule for facilities exiting the RECLAIM program. The compliance deadlines for Proposed Amended Rules 1146 and 1146.1 were established taking into consideration equipment size range, fuel type, the number of units at a facility, and facilities with multiple units subject to multiple source-specific command-and-control rules. PR 1100 allows facilities with Rule 1146/1146.1 units until January 1, 2022 to retrofit all existing units and until January 1, 2023 to replace any existing units. Proposed Amended Rule 1146.2 applies to units between 400,000 to 2 million British thermal units per hour (MMBtu/hr) and requires units to comply with the 30 ppm limit by December 31, 2023, if a technology assessment (to be completed by January 1, 2022) determines that the NO_x emission limits specified in Rule 1146.2 still represent BARCT.

Of the 103 RECLAIM facilities that will be affected by the proposed amendments, 65 facilities would be required to retrofit the non-compliant units by the compliance dates specified in PR 1100, while 20 facilities that have units that meet the applicable RECLAIM BARCT limit of 12 ppm would not need to meet the lower NO_x emission limit under Proposed Amended Rules 1146 and 1146.1 until the unit's burner replacement or 15 years after rule adoption, whichever occurs earlier. The permitted Rule 1146/1146.1/1146.2 units in the remaining 18 facilities meet the proposed NO_x emission limits, but could be impacted by the changes in Monitoring, Reporting and Recordkeeping requirements as they transition from the RECLAIM program into a command-and-control regulatory structure. The cost-effectiveness for Proposed Amended Rules 1146 and 1146.1 ranged from less than \$11,000 to \$36,000 per ton of NO_x reduced varying depending on the equipment size, type of retrofits, and the unit's operation and load. The cost-effectiveness for Proposed Amended Rule 1146.2 is less than \$10,000 per ton of NO_x reduced for Rule 1146.2 units at RECLAIM or former RECLAIM facilities to meet the current rule limit. The proposed rule amendments are estimated to reduce 0.27 tons per day of NO_x from RECLAIM equipment by January 1, 2023. For non-RECLAIM facilities, the cost-effectiveness is below \$11,000 per ton of NO_x reduced for units that would be required to demonstrate compliance upon burner replacement or 15 years after rule adoption, whichever occurs earlier. For thermal fluid heaters, the cost-effectiveness is approximately \$36,000 per ton of NO_x reduced.

CHAPTER 1: BACKGROUND

INTRODUCTION

REGULATORY HISTORY

AFFECTED INDUSTRIES

PUBLIC PROCESS

INTRODUCTION

The Regulation XX - Regional Clean Air Incentives Market (RECLAIM) was adopted in October 1993. The purpose of RECLAIM is to reduce NO_x and SO_x 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 NO_x and SO_x facility emissions allocations, program requirements, as well as monitoring, reporting, and recordkeeping requirements.

Regulation XX – RECLAIM has been amended several times to reflect BARCT on a programmatic basis and was most recently amended on December 4, 2015 to achieve BARCT equivalent programmatic NO_x emission reductions through an overall reduction in RECLAIM trading credits (RTCs) of 12 tons per day from compliance years 2016 through 2022. RECLAIM was amended on October 7, 2016 to address RTCs from facility shutdowns. In January 2018, Rules 2001 and 2002 were amended to commence the initial steps to transition RECLAIM facilities to a command-and-control regulatory approach. The most recent amendments to RECLAIM was on October 5, 2018, when Rules 2001 and 2002 were amended to provide existing facilities a pathway to voluntarily exit the RECLAIM program and add provisions to allow facilities that are notified to exit RECLAIM, the option to stay in RECLAIM until New Source Review issues are resolved.

Control Measure CMB-05 of the Final 2016 Air Quality Management Plan (AQMP) included a five tons per day NO_x 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 Best Available Retrofit Control Technology (BARCT) as soon as practicable. Consistent with the adoption resolution for the 2016 AQMP, staff is providing quarterly updates to the Stationary Source Committee on the status of the transition of RECLAIM facilities to command-and-control with quarterly reports provided on October 20, 2017, February 16, 2018, and June 15, 2018.

On July 26, 2017 California State Assembly Bill (AB) 617 was approved by the Governor, which addresses non-vehicular air pollution (criteria pollutants and toxic air contaminants). It is a companion legislation to AB 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 with emphasis on the largest emission sources first.

In 2015, staff conducted a programmatic analysis of equipment at each RECLAIM facility to determine if there are appropriate and up to date BARCT NO_x limits within existing command-and-control rules. It was determined that existing 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 update emission limits to reflect current BARCT in some existing rules.

Proposed Amended Rules (PARs) 1146, 1146.1 and 1146.2 update NO_x emission limits for boilers, heaters, and steam generators applicable to these rules. The revised NO_x emission limits represent

BARCT and apply to RECLAIM and non-RECLAIM facilities. 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 NO_x emission limits for large water heaters, boilers and process heaters less than or equal to 2 MMBtu/hr. Table 1 summarizes the applicability and existing NO_x emission limits in Rules 1146, 1146.1 and 1146.2.

Proposed Rule 1100 - Implementation Schedule for NO_x Facilities (PR 1100) establishes the compliance schedule for facilities exiting the RECLAIM program. The compliance timeframe for PARs 1146 and 1146.1 was established taking into consideration equipment size range and the number of units at each facility. Also taken into consideration within the compliance schedule are facilities with multiple units subject to multiple source-specific landing rules. PR 1100 allows facilities with Rule 1146 and/or Rule 1146.1 units until January 1, 2022 to retrofit all existing units and until January 1, 2023 to replace any existing units.

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

Rule	Applicability	Size	Summary of NO _x Emission Limits
Rule 1146	Boilers, steam generators, and process heaters	≥ 5 MMBtu/hr	<ul style="list-style-type: none"> • 5 ppm for units burning natural gas ≥ 75 MMBtu/hr; • 9 ppm for units burning gaseous fuels 5 to 75 MMBtu/hr • 30 ppm for thermal fluid heaters burning gaseous fuels • 40 ppm for nongaseous fuels • 12 ppm for atmospheric units • 15 ppm for units burning digester gas • 25 ppm for units burning landfill gas
Rule 1146.1	Boilers, steam generators, and process heaters	>2 and <5 MMBtu/hr	<ul style="list-style-type: none"> • 9 ppm for units burning natural gas • 30 ppm for thermal fluid heaters burning gaseous fuels • 12 ppm for atmospheric units • 15 ppm for units burning digester gas • 25 ppm for units burning landfill gas
Rule 1146.2	Natural gas-fired water heaters, boilers, and process heaters	≤ 2 MMBtu/hr	<ul style="list-style-type: none"> • Manufacturer limit of 20 ppm; • End-user limit of 30 ppm

REGULATORY HISTORY

The following section provides an overview of the regulatory history for Rules 1146, 1146.1, and 1146.2. All three rules currently exempt RECLAIM facilities.

Rules 1146 and 1146.1

Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters was adopted September 1988 and establishes NOx limits for boilers, steam generators, and process heaters greater than or equal to 5 MMBtu/hour.

Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters was adopted October 1990 and establishes NOx limits for boilers, steam generators and process heaters greater than 2 MMBtu/hour and less than 5 MMBtu/hour. 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. Rule 1146 establishes three groups of units based on the size or type of fuel used. The three Rule 1146 groups are as follows:

- Group I units include 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.
- Group II units include 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.
- Group III units include any unit burning gaseous fuels, excluding digester and landfill gases, and thermal fluid heaters¹ 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.

Under the 2008 amendment Rule 1146 Group I units were required to meet a lower emission limit of 5 ppm. Rule 1146 Group II and III units and Rule 1146.1 units, which represented approximately 2,100 units, were required to comply with the 9 ppm (0.011 lbs/10⁶ Btu) NOx limit by January 1, 2012 through January 1, 2015. Amendments of Rule 1146 and 1146.1 also required equipment fired by landfill or digester gas to meet emissions limits of 25 ppm and 15 ppm, respectively, by January 1, 2015. The applicable compliance date depended on the unit's rated heat capacity, the number of units at the facility, and the type of service (e.g., supplying steam at a university). Both Rules 1146 and 1146.1 were amended in November 2013 to address an issue related to rule enforceability raised by EPA.

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 establishes 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 for new units, 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/hr heat input which are regulated under SCAQMD Rule 1121. Units used in

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

recreational vehicles, and mobile homes are also exempt from the requirements of Rule 1146.2. The 1998 adoption of Rule 1146.2 established NO_x 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 NO_x and 400 ppm of CO. New units from 75,000 Btu/hr to 0.4 MMBtu/hr (Type 1) were required to meet a NO_x 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 for existing in-use equipment was implemented as the unit reached 15 years of life. Lower emissions limits for new equipment were not considered for the January 7, 2005 rule amendment because additional time was needed to evaluate low NO_x technologies and their cost-effectiveness.

Rule 1146.2 was amended again in May 2006 to address NO_x emission limits for new equipment. With the exception for small pool heaters rated less than or equal to 400,000 Btu/hr, new manufactured units greater than 400,000 Btu/hr must meet a NO_x 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) NO_x 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 NO_x 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.

AFFECTED INDUSTRIES

PARs 1146, 1146.1, and 1146.2 affect facilities in the NO_x RECLAIM program as well as facilities outside of the RECLAIM program with boilers, heaters, and process heaters that are greater than 75,000 Btu/hr. PARs 1146 and 1146.1 will require facilities to comply with lower emissions limits for applicable units located in the South Coast Air Basin and Coachella Valley. Rule 1146.2 does not have new requirements for non-RECLAIM facilities so these facilities are not impacted by the proposed amendments. In addition, PARs 1146, 1146.1, and 1146.2 exempt units that are subject to an industry-specific rule that includes a NO_x emission limit for the applicable units in Rules 1146, 1146.1, and 1146.2. For example, boilers that are subject to an emission limit in Rule 1109.1 (Refinery Equipment) and Rule 1135 (Emissions of Oxides of Nitrogen from Electricity Generating Facilities) are regulated under the respective rules, and are exempt from PAR 1146 series. On the other hand, non-electricity generating boilers are not regulated in Rule 1135, and they will be subject to PAR 1146 series. As a result, power generating boilers at electricity generating facilities and boilers at refineries that are in RECLAIM are not included in the analyses presented in this staff report.

Out of the 259 facilities currently in the NO_x RECLAIM program as of August 2018, approximately 103 facilities would be affected by PARs 1146, 1146.1, and 1146.2 and PR 1100.

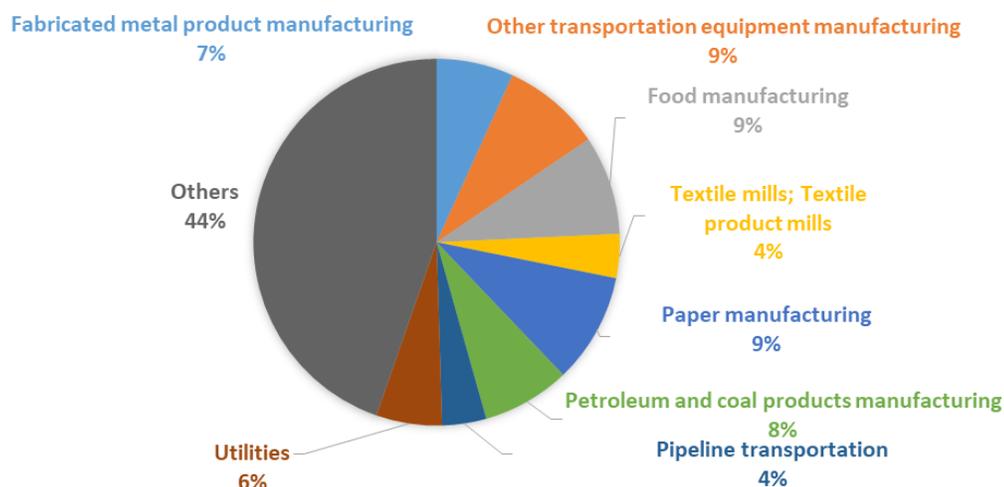


Figure 1
Industries Affected by PARs 1146 Series

When grouped according to the North American Industry Classification System (NAICS) (Figure 1), transportation equipment manufacturing, paper manufacturing, and food manufacturing are the largest contributors each accounting for 9% of the total, followed by petroleum and coal products manufacturing, fabricated metal product manufacturing, utilities, textile product mills, and pipeline transportation. Each single remaining group comprises less than 4% of the total. Remaining NAICS groups include, but are not limited to, chemical manufacturing, primary metal manufacturing, computer and electronic product manufacturing, and oil and gas extraction.

From the 2008 Rule 1146 staff report, the largest affected industry sector in non-RECLAIM was the health services industry which made up 19% for all Rule 1146 units when grouped according to Standard Industrial Classification (SIC). Next, education services and food industry sectors each accounted for 11% of the total units followed by chemicals and allied products, nonclassifiable establishments, and personal services with 4% of the total units each. Hotels and other lodging places and then executive, legislative, and general government each contributed about 3% of the total units. Remaining SIC groups contributed to less than 3% each and include, but are not limited to, textile mill products; justice, public order, and safety; fabricated metal product; and real estate. Similar distributions were outlined in the 2008 Rule 1146.1 staff report for respective units. The total size of non-RECLAIM natural gas fired equipment subject to Rule 1146 and 1146.1 is estimated to be about 2,370 units.

In the non-RECLAIM universe, there are approximately 20 digester gas fired units and three landfill gas fired units currently operating in the district. Majority of these units are operated by sewage treatment facilities and landfills that offer essential public services to various municipalities. In acknowledgement of the unique challenges faced by the industry, these units will be addressed in a separate sector specific command-and-control rule to be developed, and will not be subject to the proposed emission limits in the PAR 1146 and 1146.1.

PUBLIC PROCESS

Development of PARs 1146, 1146.1, and 1146.2 and PR 1100 was conducted through a public process. SCAQMD staff has held seven working group meetings at SCAQMD Headquarters in Diamond Bar on November 30, 2017, January 16, 2018, March 7, 2018, April 12, 2018, August

2, 2018, August 29, 2018, and October 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 was held on February 14, 2018. A California Environmental Quality Act (CEQA) scoping meeting was held concurrently with the Public Workshop. Based on additional BARCT analysis, another Public Workshop was held on September 20, 2018.

In addition to the PARs 1146, 1146.1, and 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, January 11, 2018, February 8, 2018, March 8, 2018, April 12, 2018, May 9, 2018, June 14, 2018, July 12, 2018, and September 13, 2018. On April 20, 2018 and October 19, 2018, the proposed amendments to Rule 1146 series and PR 1100 and the associated impacts were presented to the Stationary Source Committee.

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

CHAPTER 2: CONTROL TECHNOLOGIES

**BARCT ASSESSMENT FOR RULE 1146 AND 1146.1 EQUIPMENT
CONTROL TECHNOLOGY ASSESSMENT FOR RULE 1146.2
EQUIPMENT**

BARCT ASSESSMENT FOR RULE 1146 AND 1146.1 EQUIPMENT

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 follows:

Best Available Retrofit Control Technology means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.

The BARCT technology assessment for the source categories subject to the proposed amended rules included review of commercially available NO_x emission reduction technologies for boilers, steam generators, and process heaters and an evaluation of applicable NO_x concentration limits established under existing rules and regulations at other air districts. A summary of the analysis is provided below.

Assessment of SCAQMD Regulatory Requirements

As part of the BARCT assessment, staff reviewed SCAQMD Rules 1146 and 1146.1 which regulates emissions of oxides of nitrogen from industrial, institutional, and commercial boilers, steam generators and process heaters. Rule 1146 regulates units rated to greater than or equal to 5 MMBtu/hr and Rule 1146.1 regulates units rated to greater than equal to 2 MMBtu/hr and less than 5 MMBtu/hr. Current rule emission limits were adopted on September 5, 2008. All parts per million emission limits specified in rules are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.

Under Rule 1146 boilers, steam generators and process heaters fueled by gaseous fuels, excluding digester and landfill gases, are segregated into three different size groups: Group I (≥ 75 MMBtu/hr), Group II (≥ 20 and < 75 MMBtu/hr) and Group III (≥ 5 and < 20 MMBtu/hr). Group I units are limited to 5 ppm NO_x, Group II and III are limited to 9 ppm NO_x. Units that are fueled with non-gaseous fuels are subject to emission limit of 40 ppm.

Rule 1146.1 limit boilers and process heaters fueled by natural gas to 9 ppm NO_x. Both Rules 1146 and 1146.1 includes a limit of 12 ppm NO_x for atmospheric units² and a limit of 30 ppm for thermal fluid heaters. All units subject to Rule 1146 and 1146.1 fired by landfill gases are required to meet NO_x emissions limits of 25 ppm by January 1, 2015, and units fueled by digester gas are required to meet 15 ppm by January 1, 2015.

Other Regulatory Requirements

Analysis of NO_x Concentration Limits for Rules 1146 and 1146.1 Equipment at Other Air Districts

Staff reviewed other air district's requirements for Rule 1146 and 1146.1 equipment to identify rules and regulations with lower emission limits or limits representing improvements in pollution control technologies. A comparison of the requirements in the PAR 1146 series with the analogous rules adopted by four other air districts in California was made. The four air districts were San

² An atmospheric boiler is defined as a natural gas fired unit with a non-sealed combustion chamber in which natural draft is used to exhaust combustion gases.

Joaquin Valley, Sacramento Metropolitan, Ventura, and Bay Area. They are selected based on the severity of their nonattainment status for ozone and PM_{2.5} federal air quality standards.

SJVAPCD Rule 4306, SJVAPCD Rule 4307, and SJVAPCD Rule 4320

SJVAPCD Rules 4306 Boilers, Steam Generators, and Process Heaters – Phase 3 and 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr 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. SJVAPCD Rule 4307 Boilers, Steam Generators, and Process Heaters – 2.0 MMBtu/hr to 5.0 MMBtu/hr apply to any gaseous fuel or liquid fuel fired boiler, steam generators, and process heaters with a total heat input greater than or equal to 2.0 MMBtu/hr and less than or equal to 5.0 MMBtu/hr. SJVAPCD Rule 4307 limits natural gas fired non-atmospheric units to 9 ppm, natural gas fired atmospheric units to 12 ppm, and gaseous fuel-fired units to 30 ppm. SJVAPCD Rule 4320 Advanced Emissions Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr limits NO_x emissions from units with greater than a 20 MMBtu/hr input rating to 7 ppm (or 5 ppm for compliance at a later date). For units with greater than a 5 MMBtu/hr input rating up to and including 20 MMBtu/hr, emission limit was set at 9 ppm (or 6 ppm for compliance at a later date). Units located at a wastewater treatment facility fired by <50% California public utility commission (PUC) quality gas, such as biogas, emission limit was set at 12 ppm (or 9 ppm for compliance at a later date). Depending on the equipment size and selected NO_x limit, the proposed compliance date extended from January 1, 2011 to January 1, 2014.

Overall, 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). SJVAPCD is also more stringent for units located at wastewater treatment facilities fired with biogas (between 9 to 12 ppm in SJVAPCD Rule 4320 vs 15 ppm for digester gas fired units and 25 ppm for landfill gas fired units in SCAQMD Rule 1146 and Rule 1146.1) for units greater than 5 MMBtu/hr. It is important to note that for SJVAPCD'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 \geq 75 MMBtu/hr, emission limit in SCAQMD Rule 1146 (5 ppm) is more stringent than SJVAPCD's limit of 7 ppm for natural gas units.

Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 411

SMAQMD Rule 411 NO_x from Boilers, Process Heaters and Steam Generators establishes NO_x emission limits boilers greater than or equal to 1 MMBtu/hr. The emission limits range from 15 to 30 ppm for units 1 to 20 MMBtu/hr, depending on equipment size and operation. For units greater than 20 MMBtu/hr, the limit is 9 ppm. Units that are fueled with landfill gas or combination of landfill gas and natural gas are limited to between 15 ppm as of October 27, 2009.

Ventura County Air Pollution Control District (VCAPCD) Rule 74.15 and Rule 74.15.1

VCAPCD Rule 74.15 Boilers, Steam Generators and Process Heaters (5 MMBtu/hr and greater) establishes a NO_x emission limit of 40 ppm for boilers greater than or equal to 5 MMBtu/hr regardless of fuel type. 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 Boilers, Steam Generators and Process Heaters (1 to 5 MMBtu/hr). Rule 74.15.1 also requires units greater than 2 and less than 5 MMBtu/hr fueled by digester and landfill gases to meet emission limits of 15 ppm and 25 ppm respectively. The same rule requires units equal to or greater than 1 and less than or equal to 2 MMBtu/hr to limits their NO_x emissions to 20 ppmv.

Bay Area Air Quality Management District (BAAQMD) Regulation 9 Rule 7

BAAQMD Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters) establishes NO_x emission limits for boilers greater than 2 MMBtu/hr. The emission limits range from 15 to 30 ppm for units 2 MMBtu/hr 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. Units greater than 1 MMBtu/hr fueled by landfill or digester gas are required to meet emission limit of 30 ppm.

Assessment of NO_x Emission Limits for Existing Units**Permit Limits**

As part of BARCT analysis, permit limits for existing boilers, steam generators, and process heaters fueled by natural gas, landfill gas and digester gas from within SCAQMD as well as permitting databases from other agencies were reviewed. The objective of this task is to ascertain if any existing units are currently permitted below current limits of Rule 1146 and 1146.1. The analysis also looked into identifying other control technologies implemented by permitted equipment in order to achieve designated permit limits. Additional considerations were made in regards to equipment configurations such as water-tube and fire-tube. Data from outside of SCAQMD was obtained from analyzing clearinghouse databases from the United States Environmental Protection Agency (US EPA), California Air Resources Board (CARB), and various local level agencies such as San Joaquin Valley APCD and Bay Area AQMD as well as installation lists provided by equipment vendors and local air agencies.

From the US EPA and California ARB clearinghouse database, several large units (>75 MMBtu/hr) fired with natural gas were found to be permitted at 5 ppm NO_x with SCR post combustion controls, and the requirements are in line with SCAQMD Rule 1146 Group I requirements. No examples of units fired with natural gas with a permit limit of 7 ppm or below utilizing ULNB replacements were identified in the EPA or CARB clearinghouses. Similar results were found from clearinghouse databases of BAAQMD, SJVAPCD, SMAQMD and VCAPCD. From vendor provided installation lists and source test data, one new natural gas fired unit was identified in SJVAPCD with a permitted limit of 5 ppm with only ULNB. One new natural gas fired unit was identified within SCAQMD with permit limit of 7 ppm utilizing only ULNB as control technology.

Analysis of previously mentioned clearinghouse databases were also conducted for landfill gas fired and digester gas fired units. Landfill gas and digester gas are both forms of biogas created by decomposition of organic materials. Landfill gas is generated by chemical reactions between waste components and microbial action during waste decomposition occurring in landfill operations. Due to the nature of landfills, the supply of combustible gases are dependant on the amount of waste added and is expected to fall off after landfill closure as biological materials complete their decomposition process. Digester gas is generated by anaerobic biological reactions that occur inside of anaerobic digesters, or bioreactors. Rules 1146 and 1146.1 currently limits digester gas fired units to 15 ppm and landfill gas fired units to 25 ppm.

In addition to the database available online, SJVAPCD and SMAQMD provided permitting data and source test results for the landfill gas fired and digester gas fired units in the respective jurisdiction. The lowest permitted digester gas fired unit, demonstrated by source test, is located in SJVAPCD with a permit limit of 5 ppm. The unit is rated at 99 MMBtu/hr equipped with SCR post combustion control technology and was permitted as new; however, it is important to note that the source of this unit's digester gas is not from a wastewater treatment facility and would not

necessarily have the same challenges as those experienced in wastewater treatment facilities. One unit operating at a wastewater reclamation facility located in SJVAPCD was able to demonstrate compliance to a permit limit of 9 ppm with only burner replacement with ULNB technology. Digester units located in SCAQMD are permitted to a limit of 15 ppm. Based on this analysis, the lowest permitted digester gas unit across the three air districts achieved a NO_x limit of 9 ppm using a burner replacement.

The lowest permitted landfill gas fired unit, demonstrated by source test, is located in SMAQMD with a permit limit of 15 ppm. The unit located in SMAQMD is rated at 32.4 MMBtu/hr and utilized ULNB replacement technology. Another unit fired with landfill gas was identified in SJVAPCD with a permit limit of 9 ppm and rated to 38 MMBtu/hr; however, this unit is pending source test to demonstrate compliance with permitted limit. The lowest limit for permitted landfill units located in SCAQMD is rated to 115 MMBtu/hr, permitted new, limited to 21 ppm.

Permit limits from thermal fluid heaters located within SCAQMD were also analyzed. Thermal fluid heaters are a form of process heaters that indirectly heat processes through the usage of thermal fluids that are not water. Thermal NO_x emissions from thermal fluid heater differ from other water process heaters due to higher operating temperatures. The current emission limit for thermal fluid heaters under Rule 1146 and 1146.1 is 30 ppm. Permit limits for units in SCAQMD range between 9 ppm to 30 ppm. Most of the newly permitted units located in SCAQMD are given permit limits of 20 ppm based on manufacturer guarantees. One unit was found to be permitted new at 9 ppm with only ULNB technology and some units were permitted at 12 ppm utilizing burner replacements. From analysis of existing permitted limits, the unit with the lowest permitted emission limit was identified to be located in SJVAPCD with a permitted limit of 5 ppm utilizing only ULNB technology. The unit was permitted as new equipment subject to BACT. The analysis was able to show that the lowest achieved controlled emission from thermal fluid heaters utilizing burner replacements was 12 ppm.

The main limitation involved with utilizing clearinghouse databases is the frequency in which they are updated. Clearinghouse data are usually not up-to-date and do not reflect most recent best available control technology. Information that are not available in clearinghouse data are provided by vendors in the form of installation lists.

Source Test

One of the main tools used for compliance demonstration is source tests conducted under District approved protocols. Rules 1146 and 1146.1 require periodic source testing for facilities to demonstrate compliance with applicable rule and permit limits. For RECLAIM facilities permitted with concentration limits, periodic RECLAIM source tests must be conducted to demonstrate equipment operates under the permitted concentration limit.

Facility submitted source test results were analyzed to determine the technical feasibility of establishing a lower BARCT limit. Within SCAQMD, there is a total of 1,072 non-RECLAIM³ units subject to Rule 1146.1, 1,068 non-RECLAIM⁴ units subject to Rule 1146, and 259 units subject to RECLAIM rules. A total of 196 units was surveyed for real world emissions via facility submitted source test reports. Total units surveyed make up for 8.2% of total units located in SCAQMD with 105 units from the non-RECLAIM universe and 91 units from the RECLAIM

³ Command and control equipment distribution figures obtained from 2008 rule revision staff report for Rule 1146 and 1146.1

⁴ Command and control equipment distribution figures obtained from 2008 rule revision staff report for Rule 1146 and 1146.1

universe. Source tests were obtained from SCAQMD database which consists of reports submitted by facilities to demonstrate compliance to various monitoring and testing requirements. SCAQMD requires equipment source tests to be conducted in an “as found” condition and emissions results are an average of the testing period. Some source test are conducted at different “loads” at a set time span. To account for source tests conducted at multiple load settings, the highest emission result was used for the analysis.

From the data set mentioned above, 34 units were subject to Rule 1146.1 NO_x limits for natural gas fired equipment ranging from 9 to 12 ppm. Ten out of the 34 natural gas fired units were atmospheric units subject to the rule limit of 12 ppm. Six out of 10 atmospheric units were source tested about 10% below the rule limit (i.e., below 10.8 ppm), three out of 10 atmospheric units were source tested >30% below the rule limit (i.e., <8.4 ppm), and one out of 10 atmospheric units were source tested <10% below rule limit (i.e., between 10.8 to 12 ppm). It should be noted that the three atmospheric units tested >30% below the rule limit were all new installations. Twenty four of the 34 units were non-atmospheric units. Thirteen out of the 24 non-atmospheric units demonstrated <10% below the rule limit. The remaining eleven out of 24 non-atmospheric units demonstrated levels substantially lower (> 30%) than 9 ppm (i.e., below 6.3 ppm). Among the 11 units, nine were new or modified units permitted at BACT, and 2 utilized burner replacements. The source test results demonstrate that it is technically feasible for a Rule 1146.1 unit to achieve an emission level of 7 ppm with a burner replacement, providing at least 10% buffer for rule compliance. From this analysis, the source test records do not support the feasibility of Rule 1146.1 atmospheric units to achieve an emission level of 9 ppm with only a burner replacement, after providing a 10% buffer for possible rule compliance.

A total of 134 units surveyed were subject to Rule 1146, with 2 atmospheric units (5 to 10 MMBtu/hr), 73 units in Group III (5 to 20 MMBtu/hr), 44 units in Group II (20 to 75 MMBtu/hr) and 15 units in Group I and II equipped with SCR. Units equipped with SCR are required to meet 5 ppm regardless of unit size, so analysis summary combined Group I and SCR equipped units together.

Results displayed in Table 2 show that it is technically feasible for Rule 1146 Group III and Group II units to achieve an emission limit of 7 ppm with burner replacements; and Rule 1146 units equipped with SCR to achieve an emission limit of 4 ppm, both providing a 10% buffer for possible compliance demonstration. Table 2 also shows that it is not technically feasible for Rule 1146 atmospheric units to achieve an emission level of 9 ppm with burner replacements.

Table 2
Source Test Evaluation for Rule 1146 Equipment

Category	Equipment Range	Current Rule Limit	Total Units Surveyed	Number of Units Tested to be > 30% below Existing Rule Limit	
				New	Retrofit
Rule 1146 Atmospheric (Group III)	5-10 MMBTU/HR	12 ppm	2	2	0
Rule 1146 Group III	5-20 MMBTU/HR	9 ppm	73	9	2
Rule 1146 Group II	20-75 MMBTU/HR	9 ppm	44	10	2
SCR Equipped Boilers (Groups I, II, & III)	21-127 MMBTU/HR	5 ppm	15	1	5

Source tests records from a total of 14 thermal fluid heaters ranging from 2 MMBtu/hr to 10 MMBtu/hr with emissions limit of 30 ppm were evaluated. Five out of 14 units source tested substantially (>64%) below the permit limit. Out of the five units, 3 units were new or modified equipment permitted at BACT and 2 units utilized burner replacements. This shows that it is technically feasible for Rule 1146.1 and 1146 thermal fluid heaters to achieve an emission level of 12 ppm with burner replacements after providing at least 10% buffer for rule compliance.

In addition to natural gas fired units, source test results of 10 digester gas fired units and three landfill gas fired units subject to Rule 1146 and 1146.1 were also evaluated. Digester gas fired units ranged between 3 to 63 MMBtu/hr while landfill gas fired units ranged from 115 to 335 MMBtu/hr. Out of 10 digester gas fired units, five units source tested substantially (>40%) below permit limit of 15 ppm. Out of those five units, two units were boilers with burner replacements and the other three units were permitted new. These results show that it is technically feasible for digester gas fired units to meet emission limits lower than 15 ppm with only burner replacements. Out of the three source tests for landfill gas fired units, two units were source tested to show emissions below permitted limits (>20%) of 21 and 25 ppm. Surveyed units in the landfill facilities are operating with the burners that were originally equipped for the boilers. Original permit applications for the three landfill gas fired units were submitted between 1984 and 1990. Even though analyzed source test results were limited to equipment operating with burners designed back in original permit application, test results suggest that it is feasible for currently equipped burners to be able to meet a lower emission limit; however, the two landfills located in SCAQMD had been closed. Additional analysis will be required in order to determine the effects of lowering quality of gas from inactive landfills.

Continuous Emissions Monitoring System

Continuous emissions monitoring systems (CEMS) are continuous monitors affixed to the equipment's exhaust stack that offers constant real time averages (both 15 minute and hourly) for NO_x or CO depending on the type of analyzer used. CEMS are used in both non-RECLAIM and RECLAIM applications. RECLAIM major sources are required to have continuous NO_x emissions monitoring in the form of CEMS or district approved equivalent. CEMS systems in NO_x RECLAIM are used to track NO_x emissions at the equipment stack and calculate mass NO_x emission averages in real time. RECLAIM CEMS are also used to transmit daily aggregate emission reports to District central station for RECLAIM reporting purposes. Facilities equipped with CEMS are required to conduct annual relative accuracy test audit (RATA) to demonstrate the accuracy of each system.

CEMS data from two RECLAIM major sources and three non-RECLAIM landfill gas fired sources were analyzed to study the behavior of equipment emissions throughout the span of an operational year. Analyzed CEMS data consists of 15 minute average and hourly average. The hourly average data is calculated from four 15 minute "quadrants" for every hour. Fifteen minute "quadrants" consists of averages of minute data that is collected from the CEMS analyzer located at the equipment exhaust stack. CEMS analyzers also have certified ranges of detection and data points are only valid between 10 to 95% of total analyzer range. To ensure accuracy of the analyzer data, data points that reside outside of CEMS analyzers certified valid ranges are excluded from this analysis.

CEMS data from two RECLAIM major sources were analyzed, and both units were equipped with SCR post combustion controls with permit limits of 5 ppm. The analyzed data show while facility's RATA results demonstrated emissions that were considerably (>30%) lower than the permit limit, CEMS readings demonstrated that the real world emissions (in ppm @ 3% O₂) from

major sources with permit limit of 5 ppm often fluctuate from 3 ppm to 4.5 ppm even though facility passed annual RATA or periodic source tests with emissions results of <3.5 ppm. Results from this analysis were considered for preliminary staff BARCT recommendations.

In addition to analyzing RECLAIM CEMS results, CEMS data from all three landfill gas fired boilers located in SCAQMD were analyzed to study the behavior of emissions from landfill gas fired equipment. Facility reported emissions for both 15 minute averages and one hour averages. It is important to note that CEMS from RECLAIM and non-RECLAIM units serves different purposes. RECLAIM CEMS are utilized for emissions reporting while non-RECLAIM CEMS are used as a tool of enforcement. Rule 1146 contains periodic monitoring requirements that utilize both 15 minute and 60 minute averages. In order to take a conservative approach, focus was given to the 15 minute data in order to understand emissions behavior from landfill gas fired sources. CEMS analyzers are certified for accuracy only within 10 to 95% of their rated ranges; therefore, all measurements outside of their respective analyzer certified ranges were deemed invalid. Monthly averages of valid CEMS 15 minute data was calculated to obtain a macro perspective of equipment emissions. From the calculated monthly averages of 15 minute data, one out of three units demonstrated emission levels between 16 to 18 ppm NO_x while the other two units demonstrated emissions of around 21 ppm NO_x.

Monthly emission ranges from valid CEMS data also analyzed to provide understanding of emissions behavior for landfill gas fired equipment. One concern raised from stakeholders is the inconsistencies in equipment emissions due to gas “pockets” which would cause emission levels to unexpectedly spike without warning, resulting in violation of rule and permit requirements. To better understand this behavior, monthly maximum and minimum was determined from valid set of emissions data and standard deviation was calculated using the same valid monthly dataset used to calculate monthly emissions averages. It is observed that standard deviations across all data sets were relatively small which indicate a relatively small data spread; however, there were 1 to 2% of data points from each month that exceeded equipment permit limits. Start up and shutdown periods were accounted for due to the periods of inactivity before or after. Monthly maximums for some months were observed to be over twice the monthly average. In conclusion all three landfill gas fired units show fluctuations with their real world emissions. Results from this analysis were considered for preliminary BARCT recommendations and possible future rulemaking.

Monitoring, Reporting and Recordkeeping (MRR)

RECLAIM

Under RECLAIM 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 NO_x 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. A summary of the MRR requirements is discussed here and additional analysis can be found in Appendix A.

Major sources are units with a total heat input rating of greater than or equal to 40 MMBtu/hr with total annual fuel usage of greater than 90 Billion Btu. Units that are classified as major sources are required to install a continuous emissions monitoring system (CEMS) or District approved

equivalent. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements for major sources such as annual (or semi-annual) relative accuracy testing (RATA), daily emissions electronic reporting, quarterly aggregate electronic reporting, quarterly emissions reports (QCER), and annual emissions report (APEP).

Large sources are units with a total heat input rating of greater than or equal to 10 MMBtu/hr and less than 40 MMBtu/hr with annual emissions of between 4 and 10 tons. Under the RECLAIM program, units classified as large sources are required to electronically report monthly emissions and quarterly aggregate emissions as well as QCER and APEP requirements. Large sources are also required to conduct source testing every three years and conduct semi-annual tuning.

Process units are units with a total heat input rating of between 2 MMBtu/hr and 10 MMBtu/hr. Process units share similar reporting requirements as Rule 219 exempt equipment which are rated to less than or equal to 2 MMBtu/hr. Both process units and Rule 219 exempt equipment are required to submit quarterly electronic emissions reports as well as QCER and APEP requirements. Process units assigned concentration limits are required to conduct source testing every five years and all process units are required to conduct semi-annual tuning. Rule 219 exempt equipment are not subject to periodic testing or tuning requirements unless required by permit.

Non-RECLAIM

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. Rules 1146 and 1146.1 also requires periodic emissions monitoring for facilities to demonstrate compliance to emission concentration limits.

Non-RECLAIM units with total heat input rating of greater than or equal to 5 MMBtu/hr are subject to Rule 1146. Rule 1146 units with the exception of CEMS equipped units are subject to periodic monitoring and source testing to demonstrate compliance to command-and-control concentration limits. Facilities are required to conduct initial periodic monitoring either monthly or every 750 hours and then quarterly or every 2,000 hours after three consecutive passes. Source testing is required every three years for units with total heat input of greater than or equal to 10 MMBtu/hr and every five years for units with total heat input of greater than or equal to 5 MMBtu/hr and less than 10 MMBtu/hr. CEMS is required for units with total heat input of greater than or equal to 40 MMBtu/hr and with total annual heat input of greater than 200 Billion Btu. Units equipped with CEMS are also subject to monitoring and reporting requirements of Rule 218 which includes annual relative accuracy testing (RATA), and semi-annual reporting. Periodic tuning is required for units complying with low-use requirements.

Non-RECLAIM units with total heat input of greater than 2 MMBtu/hr and less than 5 MMBtu/hr are subject to Rule 1146.1. Rule 1146.1 units are subject to periodic monitoring and source testing to demonstrate compliance to command-and-control concentration limits. Facilities are required to conduct initial periodic monitoring either quarterly or every 2,000 hours and then semi-annually or every 4000 hours after four consecutive passes. Source testing is required every five years. Periodic tuning is required for units complying with low-use requirements.

Rule 1146.2 applies to units rated to less than or equal to 2 MMBtu/hr and does not require periodic monitoring, recordkeeping or reporting.

Comparison of MRR Requirements in RECLAIM and Non-RECLAIM

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 checks, (c) reporting, (d) recordkeeping, and (e) missing data procedures are

presented in Appendix A Tables A1-5, respectively. In general, RECLAIM MRR and Rule 1146 command and control MRR are comparable. The reporting element of the RECLAIM program is more comprehensive than Rule 1146 command and control requirements; however, the focus of RECLAIM reporting is to certify the accuracy of RTC reconciliation while the focus of Rule 1146 reporting is for compliance determination. RECLAIM periodic compliance monitoring and Rule 1146 command-and-control periodic compliance monitoring are generally comparable with the exception of facilities operating a unit that is in between the CEMS applicability threshold or facilities subject to Title V.

Since the applicability threshold in annual heat input is lower in RECLAIM, it is possible that a piece of 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. Mass emissions reported by RECLAIM facilities are used to track and demonstrate compliance in the RECLAIM program and not necessarily required to demonstrate compliance to Rule 1146. Facilities transitioning from RECLAIM to an equipment-based command-and-control regulatory structure should be subject to the same regulatory requirements as other non-RECLAIM facilities. In particular, Rule 1146 was approved in the California State Implementation Plan (SIP) in 2014 (79 FR 57442). It was determined by EPA that Rule 1146 is consistent with the relevant policy and guidance as required under the Clean Air Act.

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. SCAQMD has developed guidelines, outlined in SCAQMD Periodic Monitoring Guidelines⁵, for periodic monitoring, testing and recordkeeping requirements that may be incorporated in Title V permits. Currently, the monitoring requirements in the RECLAIM program are comprehensive and address the Title V periodic monitoring requirements. Staff is currently working on adopting Proposed Rule 113 – Monitoring, Reporting, and Recordkeeping (MRR) Requirements for NO_x and SO_x Sources in order to address the additional MRR as required by the Title V program.

Assessment of Pollution Control Technologies

Ultra-Low NO_x Burners Systems

For gaseous fuels, thermal NO_x is generally the largest contributor of NO_x 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 NO_x include reduced flame temperature, shortened residence time, and an increased fuel to air ratio. To reduce NO_x 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 time at high combustion temperature; and reduced oxygen concentration in the high temperature zone.

There are a variety of configurations and types of burners for ultra-low NO_x burner (ULNB) systems. 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 NO_x emissions. Radiant premix burners with ceramic,

⁵ Periodic Monitoring Guideline. <http://www.aqmd.gov/home/permits/title-v/title-v-requirements#pm>.

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 NO_x 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 staff report to Rule 1146 and 1146.1 that there was clear evidence that these types of burners had been successfully retrofitted on boilers and heaters according to SJVAPCD in their Rule 4306. Source tests that were conducted in conjunction with Rule 4306 showed a 98% compliance rate with a 9 ppm NO_x limits using ultra-low NO_x burners. In 2010, SCAQMD staff published a technology assessment report discussing the implementation assessment of ultra-low NO_x burners subject to Rules 1146 and 1146.1. The report concluded that the 9 ppm NO_x limit can be achieved by ultra-low NO_x burner systems for boilers and process heaters greater than 2 MMBtu/hour. There were ultra-low NO_x burners from 16 different manufacturers that could achieve the 9 ppm NO_x compliance limit.

Selective Catalytic Reduction (SCR) Systems

SCR is a post-combustion control technology that is a commercially available commonly employed to control NO_x emissions from boilers and other NO_x sources. It is considered to be BARCT, if cost-effective, for controlling NO_x emissions from 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 NO_x in the presence of ammonia. Ammonia is injected in the flue gas stream where it reacts with NO_x and oxygen in the presence of the catalyst to produce nitrogen and water vapor.

For conventional SCRs, the minimum temperature for NO_x reduction is 500 degrees F and the maximum operating temperature for the catalyst is 800 degrees 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 degrees F and 750 degrees F to limit the occurrence of several undesirable side reactions at certain conditions. 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. However, newly permitted SCR systems have an ammonia slip limit of 5 ppmv. In addition to the conventional SCR catalysts, there are high temperature SCR catalysts that can withstand temperatures up to 1200 degrees F and low temperature SCR catalysts that can operate below 500 degrees F.

Based on the 2008 staff reports for Rule 1146 and 1146.1, SCR as applied to Rule 1146 boilers can achieve NO_x concentrations from 5 to 6 ppm for units greater than or equal to 75 MMBtu/hr.

Other Potential Technologies

The following section summarizes an alternative 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 degrees 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, more testing/demonstration would be needed before sustainability / durability is proven.⁶

Vendors Discussion

The following nine vendors and manufacturers (in alphabetical order) were contacted requesting information regarding ULNB and SCR systems. Five out of the nine provided technical input and cost estimates that has been included in the discussion below and the cost-effectiveness analysis in this staff report.

- Alzeta
- California Boiler
- Heat Transfer Solutions
- McGill AirClean
- McKenna Boiler
- Nationwide Boiler
- Parker Boiler
- RF MacDonald
- Superior Boiler

Ultra-Low NOx Burners Systems

Except for atmospheric units and thermal fluid heaters, the current NOx limit for units burning gaseous fuels, excluding digester and landfill gases, with a rated heat input capacity between 2 and 75 MMBtu/hr is 9 ppm. Based on the information obtained through vendor discussions, lower NOx emissions with ultra-low NOx burners are feasible for burner replacements and new installations. For certain applications and for new installations, achieving 5 ppm NOx limit with an ultra-low NOx burner without SCR is feasible. Based on discussions with three vendors, burner replacements on existing units could potentially meet 7 ppm or less. With the exception of one

⁶ “Clearsign Ultra Low NOx Technology”, San Joaquin Valley APCD, November 7-8 2017.

vendor, 7 ppm or less with ultra-low NO_x burners are limited to fire-tube boilers and not currently available for water-tube boilers. The difference between water-tube and fire-tube boilers is that a water-tube boiler circulates water through a series of tubes, the tubes are heated externally by the combustion gas, and the surrounding hot gases heat the water in the steam-generating tubes; whereas a fire-tube boiler passes combustion gases inside a series of tubes that are surrounded by a closed vessel of water that is heated to produce steam.

Two of the three vendors stated they would be able to provide 7 ppm ultra-low NO_x burner replacements for existing units with a rated heat input capacity greater than 2 MMBtu/hr and up to 30 MMBtu/hr for one vendor and 60 MMBtu/hr for the other. The third vendor that could provide 7 ppm ultra-low NO_x burner replacements specified a rated heat input capacity of at least 8.4 MMBtu/hr, since a minimum furnace size would be required, and up to 50 MMBtu/hr. In addition to these size requirements, based on discussions with the third vendor, the proper back and steam pressure, as well as the age of the unit would be factors in whether an existing unit could achieve a NO_x emission limit of 7 ppm or less with a burner replacement. Additionally, for existing units to achieve 7 ppm or less with ultra-low NO_x burner replacements additional controls, such as variable frequency drive (VFD) and oxygen trim are also needed. In addition to the information gather from vendor discussions, the source test results summarized above show that it is technically feasible for existing Rule 1146 Group II and Group III and Rule 1146.1 units to achieve an emission limit of 7 ppm or less with burner replacements.

SCR Systems

The NO_x emission limit specified in Rule 1146 for Group I units is 5 ppm, which is met with the use of SCR. SCR systems are scalable and generally utilized for units greater than 10 MMBtu/hr. Based on the information obtained through vendor discussions, it is potentially feasible for retrofit units to meet 4 ppm or less. While vendors have not been able to guarantee 3 ppm or less for SCR retrofits for units subject to the proposed amendments, there are some applications that can achieve 4 ppm or less. However, there are several limitations for SCR retrofits to meet 4 ppm or less, such as the age, flow, and size of the catalyst bed of the existing SCR system. Another factor that might limit SCR retrofit applications from meeting 4 ppm or less is the required 5 ppm ammonia slip; for example, NO_x emissions of 2.5 ppm is feasible but at the cost of higher ammonia slip (i.e. 10 ppm). The existing catalyst bed might not be large enough to comply with both the lower NO_x limit and the 5 ppm ammonia slip limit. Additionally, a NO_x feedback analyzer will most likely be needed in order to maintain the lower NO_x levels. The most significant constraint is the inadequate safety margin between the permitted limit and the actual emissions to account for fluctuations in external factors such as ambient temperature or fuel heat input (i.e. gas Btu).

Atmospheric Units

Atmospheric units are currently required to meet 12 ppm NO_x in Rules 1146 and 1146.1. A vendor has stated that they can provide new atmospheric units with ultra-low NO_x burners to meet 9 ppm. However, this lower limit would not be feasible for all retrofit applications via burner replacement. Since fluctuations in ambient conditions affect atmospheric units more than sealed combustion units, a 9 ppm NO_x emission limit is currently not feasible for retrofitted atmospheric units.

Thermal Fluid Heaters

The NO_x emission limit for thermal fluid heaters in Rules 1146 and 1146.1 is currently 30 ppm. Thermal fluid heaters typically operate at much higher temperatures than process heaters that use water as the heating fluid, which could result in higher NO_x emissions. Based on discussions with vendors, thermal fluid heaters with ultra-low NO_x burners guaranteed to meet 20 ppm or less are available. While 9 ppm is available for new units of certain applications, burner replacements for

existing units could meet 15 to 12 ppm. However, there could be some loss in efficiency for the units since premix combustion burners requires higher percentage of oxygen.

Landfill and Digester Gas Fired Units

The NO_x emission limit for digester gas fired units in Rules 1146 and 1146.1 is currently 15 ppm. Based on discussions with vendors, digester gas fired units can be guaranteed to meet 12 ppm, while 9 ppm is dependant on fuel composition and heating value which can vary depending on facility. NO_x concentrations limits below 7 ppm is not feasible due to the presence of H₂S. Lowering digester gas emissions might also cause an increase in CO emissions.

The NO_x emission limit for landfill gas fired units in Rules 1146 and 1146.1 is currently 25 ppm. Based on discussions with vendors, it is feasible for landfill gas fired units to meet between 15 to 20 ppm NO_x when the methane concentration of supplied landfill gas is between 50 to 60%. If fuel is supplemented by up to 10% natural gas by volume, methane concentration requirement of supplied landfill gas can be lowered to 50%.

Low-Fuel Use Units

Rule 1146 and 1146.1 each include a provision for units that operate with low fuel usage. The low fuel use provisions limit annual usage to <90,000 therms/year and <18,000 therms/year, in Rule 1146 (c)(5) and Rule 1146.1 (c)(4) respectively. As a matter of illustration, the operating capacity for a 10 MMBtu/hr unit with an annual usage of 90,000 therms/year is approximately 11 percent. The annual fuel usage limit is listed as a condition in the permit, and is used for compliance determination. If a low fuel use unit exceeds the fuel usage limit in the permit, the operator or owner of the unit shall demonstrate compliance with the BARCT emission limit within 18 months after the exceedance. Although low fuel use units are exempt from the BARCT emission limits, they are still subject to a NO_x emission limit of 30 ppm (or 0.036 lbs/10⁶ Btu) upon the unit's burner replacement. The 30 ppm limit was established based on the "off-the-shelf" technology that was available back in the technology assessment of the 2008 amendments. As part of the current BARCT assessment, the emission limit for low fuel use units is reassessed. Whereas the BARCT emission limits, representing the *best* available retrofit control technology, for Group I, Group II, and Group III units vary from 5 to 9 ppm, the current "off-the-shelf" technology for a *basic* retrofit for a natural gas fired unit is 12 ppm. The emission limit of 12 ppm was based on discussion with vendors, taking into the consideration that many of the low fuel use units have a higher equipment life and they have been in operation for more than 30 years. Nonetheless, given the low fuel usage, it is not cost effective to require immediate retrofits for these units (see the cost-effectiveness section for more details). Therefore, it is recommended for low fuel use units to meet a NO_x emission limit of 12 ppm upon replacement of burner.

Summary of BARCT Technology Assessment for Rules 1146 and 1146.1

Natural Gas Fired Equipment

Based on the review of the types of pollution control technologies available to reduce NO_x emissions applicable to the boilers, steam generators and process heaters subject to Rule 1146 and 1146.1, SCR and ultra-low NO_x burners are still the main technologies that can achieve the NO_x concentration limits specified in these rules.

Natural gas fired units make up for the majority of equipment subject to Rules 1146 and 1146.1. Currently, San Joaquin Valley APCD Rule 4320 limits units with greater than a 20 MMBtu/hr input rating to 7 ppm (or 5 ppm for compliance at a later date) with an option to comply with a mitigation fee. Source test and permitting data from SJVAPCD demonstrated that compliance to their limits was being achieved without the need for facilities to comply with this mitigation fee

option. Based on source test records, it is technically feasible to retrofit non-atmospheric units and thermal fluid heaters to meet lower emission limits as shown in Table 3. Information obtained from vendor discussions confirms findings from the source test analysis. Considerations were made on the operational differences between water-tube and fire-tube boilers which could impact the ability for equipment to come into compliance with staff's recommendations. With additional considerations to the operational differences between water-tube and fire-tube boilers, staff proposes different limits for these types of boiler groups. Staff's recommendation based on feasibility is shown in Table 3.

Table 3
Staff Recommendations for Rules 1146 and 1146.1

Group	Size (MMBtu/hr)	Recommended Emission Limit	Supporting Evidence
Rule 1146 Group I	≥75	5 ppm via SCR (same as existing limit)	N/A
Rule 1146 Group II	≥20 to <75	For units > 12 ppm: 5 ppm via SCR For units ≤ 12 ppm: Fire-tube boilers: 7 ppm via ULNB Other boilers: 9 ppm via ULNB	<ul style="list-style-type: none"> Existing permitted equipment currently equipped with SCR Source test results from permitted equipment Scalability of SCR technology from vendor discussions
Rule 1146 Group III	≥5 to <20	Fire-tube boilers: 7 ppm via ULNB Other boilers: 9 ppm via ULNB	<ul style="list-style-type: none"> Existing equipment permitted at 7 ppm Source test result from permitted equipment Vendor discussions backs up feasibility of 7 ppm retrofits for fire-tube equipment
Rule 1146.1	>2 to <5	Fire-tube boilers: 7 ppm via ULNB Otherboilers: 9 ppm via ULNB	<ul style="list-style-type: none"> Source test result from permitted equipment Vendor discussions backs up feasibility of 7 ppm retrofits for fire-tube equipment
Atmospheric Units	≤10	12 ppm via ULNB (same as existing limit)	N/A
Thermal Fluid Heaters	N/A	12 ppm via ULNB	<ul style="list-style-type: none"> Existing equipment permitted at 12 ppm Source test result from permitted equipment Vendor discussions backs up feasibility of 12 ppm retrofits

Landfill and Digester Gas Fired Equipment

Analysis of source test results from digester gas fired equipment demonstrated that it is feasible for digester gas fired units to be retrofitted to meet a lower BARCT limit. Rules 1146 and 1146.1 currently require digester gas fired units to meet NO_x emission limits of 15 ppm. However SJVAPCD Rule 4320 contains a more stringent limit of 9 to 12 ppm for all units fired with <50% PUC quality natural gas. Since SJVAPCD allows facilities to mix in up to 50% PUC quality natural gas in order to meet their rule limits, it allows facilities greater flexibility to demonstrate compliance to their rule limits. Units located in SCAQMD demonstrate compliance to biogas limits in rules 1146 and 1146.1 with between 90% to 100% biogas content while units that are co-fired with natural gas (>10% of total usage) require emissions limit to be calculated by the weighted average of each fuel. When allotted for 50% mix of PUC quality natural gas and digester gas, the weighted average is around 12 ppm which is near SJVAPCD's rule limit of 9 to 12 ppm. During the 2008 rule amendment for Rules 1146 and 1146.1, the compliance date for units fired with digester gas was set to January 1, 2015. As a result, most of the facilities recently retrofitted their units to meet the 15 ppm requirement. Given an average lifetime of 15 years for burners, the retrofitted units could have a remaining lifetime of >10 years. By requiring facilities to meet a lower limit three years after the previous amended compliance date could possibly result in

stranded assets. Due to the nominal differences between SCAQMD and SJVAPCD limits as well as the relatively recent compliance date for digester gas fired boilers, staff recommends retaining current NO_x emission limits for digester gas fired boilers at this time.

In addition to single fueled and co-fired boilers, there are dual fuel boilers. Some dual fuel units located at sewage treatment facilities are capable of utilizing both natural gas and digester gas separately, but cannot be co-fired from a fuel mix. Due to the separation of fuels, dual fuel boilers are permitted to meet both the limit for digester gas and natural gas depending on the fuel used unlike the weighted average emissions limit of co-fired units. Source tests obtained from a retrofitted dual fuel unit in SJVAPCD was able to demonstrate that dual fuel units are capable of achieving 7 ppm when firing on natural gas only. Digester gas and natural gas fired dual fueled units located in SCAQMD are primarily used in wastewater treatment facilities which provide essential public services. Currently SJVAPCD Rule 4320 limit for dual fueled boilers located at wastewater treatment plants is 9 ppm instead of the 7 ppm limit for natural gas fired equipment. Dual fueled units located at sewage treatment facilities within SCAQMD are currently permitted to meet 15 ppm for digester gas and 9 ppm for natural gas. Wastewater treatment facilities need the ability to quickly switch between the two fuels depending on demand which leaves little to no time to retune the boiler for each fuel. There are no examples of digester gas and natural gas dual fueled units located in SJVAPCD or SCAQMD that are currently permitted to 7 ppm when fired by natural gas. Due to the nature of dual fueled units from the varying BTU ratings from natural gas and digester gas, additional analysis is required to determine BARCT for this type of equipment located at wastewater treatment facilities.

Three active landfill gas fired boilers located at two closed landfills in SCAQMD were identified, one is rated to 115 MMBtu/hr and the remaining two are identical units rated to 335 MMBtu/hr, all three units are permitted below current rule limit of 25 ppm. One landfill was closed in 1996 and the other one was closed in 2013. All three landfill gas fired units located in SCAQMD are operating with original burners permitted in 1984 and 1990. Source test results from SMAQMD demonstrated the feasibility for a lower rated unit (32.4 MMBtu/hr) to meet a NO_x limit of 15 ppm and one ULNB retrofitted landfill gas fired unit located in SJVAPCD has a permit limit of 9 ppm; however, all the landfill gas fired units located in SCAQMD are larger in size. Based on discussions with vendors, landfill gas fired units should be able to meet concentration limits between 15 to 20 ppm if the methane concentration of supplied landfill gas is between 50 to 60%, which may differ between facilities. Based on landfill gas analysis conducted during the equipment source tests in 2017, the current methane concentration from both closed landfills ranged between 27 to 33%.

Two facilities located in SCAQMD operating three identified landfill gas fired boilers are closed as of 1996 and 2013. Throughout the rulemaking process, stakeholders that operate equipment fired with landfill gas voiced concerns regarding to the decline in fuel quality and fuel production due to landfill closure. Based on input from facility operators, another challenge faced by these facilities is that replacement and retrofitting will be costly due to the age and unique layout of their equipment. Facility operators also noted that there is no guarantee the newer equipment will be able to operate on the current low methane content of the landfill gas. As for the equipment found in other air districts such as SJVAPCD and SMAQMD, the units identified are significantly smaller in size, so their analysis to establish respective BARCT limits do not necessarily account for the same challenges as the equipment located in SCAQMD. Stakeholders have also raised concerns in regards to the reliability of dual fuel units that can also meet 7 ppm when firing with natural gas only; citing that it is crucial for units to quickly and reliably switch between the two fuels, and facilities do not have time to retune everytime fuel switch occurs.

In consideration to the unique challenges faced by sewage treatment facilities and landfills providing essential public services, staff has decided not to change the NO_x concentration limits at this time and to initiate a separate rulemaking efforts to establish an industry specific rule for equipment operated at POTWs and sanitation districts to better address the uniqueness of these facilities such as the type, quantity, and quality of gas and that these units are at essential public services.

Cost-Effectiveness Analysis

In order to assess the cost-effectiveness for the proposed BARCT limits, cost information about the control equipment was obtained from discussions with manufacturers and vendors, as well as from the U.S. EPA SCR Cost Manual⁷. The cost for the control equipment consists of two main components, the capital cost and annual cost. The capital cost is a one-time expense of the equipment, installation, and permitting fees, whereas the annual operating cost includes any recurring expense, such as the cost for electricity, operation and maintenance (O&M), monitoring, and consumables like ammonia and catalyst.

Cost estimates for the equipment and installation were obtained from 5 vendors. The cost depended on the equipment size, NO_x emission limit, and the type of retrofit control technology (ultra-low NO_x burner or SCR). The budget prices obtained assumed the cost was for retrofits only, that there would be no major changes to existing units such as major structural or foundation changes. Additionally, the useful life for the control equipment was assumed to be 15 years for ultra-low NO_x burners and 25 years for SCR. As shown in the graphs below in Figures 2 and 3, when the average costs were compared, there were substantial deviations because of outlier prices obtained from one vendor. To be conservative, the cost-effectiveness analysis is based on the average cost including the outlier. In addition to the average cost for the equipment and installation, the permitting fees are included as part of the capital cost in the cost-effectiveness analysis. The most current fee rates in Rule 310 – Permitting and Associated Fees were used to estimate the permitting cost for each category grouped by unit size. Additionally, a recurring cost for SCR retrofits was included in the cost-effectiveness analysis to account for the annual operating permit renewal fee for SCR systems.

⁷ U.S. EPA SCR Cost Manual available at:
https://www3.epa.gov/ttn/ecas/docs/SCRCostManualchapter7thEdition_2016.pdf.

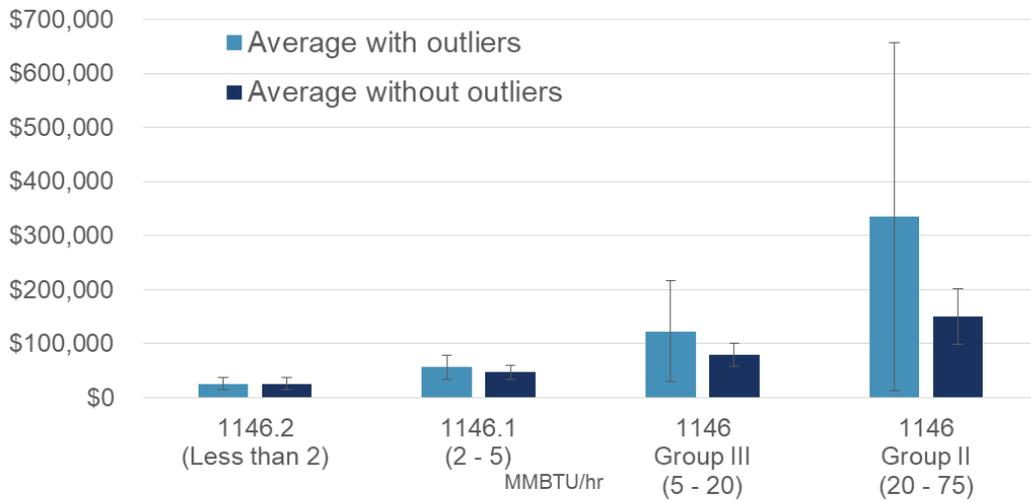


Figure 2
Average Cost with Outliers (Ultra-Low NOx Burner Replacements)

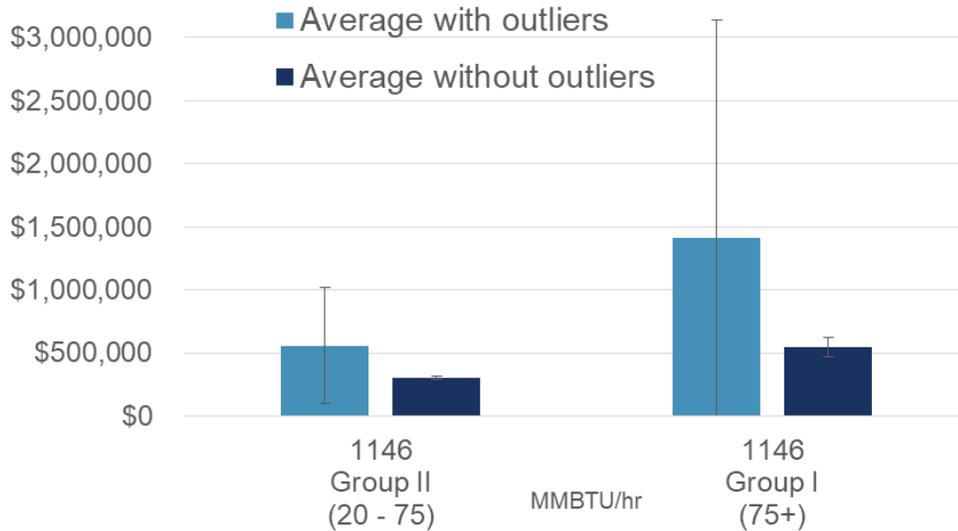


Figure 3
Average Cost with Outliers (SCR Retrofits)

The average equipment and installation cost for Rule 1146 Group I, Group II, Group III, and Rule 1146.1 units was based on the vendor cost estimates for natural gas units of a given size within the size range of each group category. Figures 4 through 9 show the linear correlations between equipment and installation cost for natural gas fired units based on size (MMBtu/hr). The linear correlation equation (rounded up to two significant figures) displayed in the figures below are for 9 ppm ultra-low NOx burner replacements and 5 ppm SCR retrofits. In the figures below, each data point is the average vendor cost with outliers for a natural gas unit of a given size. The equipment and installation cost for 9 ppm ultra-low NOx burner replacements for existing units with a rated heat input capacity between 2 and 60 MMBtu/hr are shown in Figures 4 and 5. Figure 6 and 7 shows the equipment and installation cost for 5 ppm SCR retrofits for existing units with a rated heat input capacity between 40 and 181.3 MMBtu/hr.

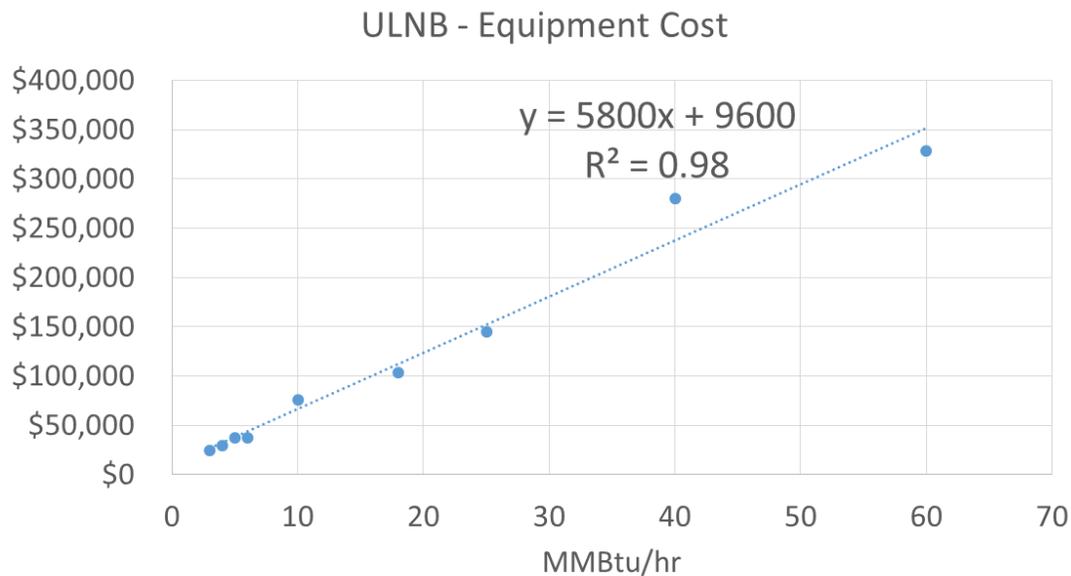
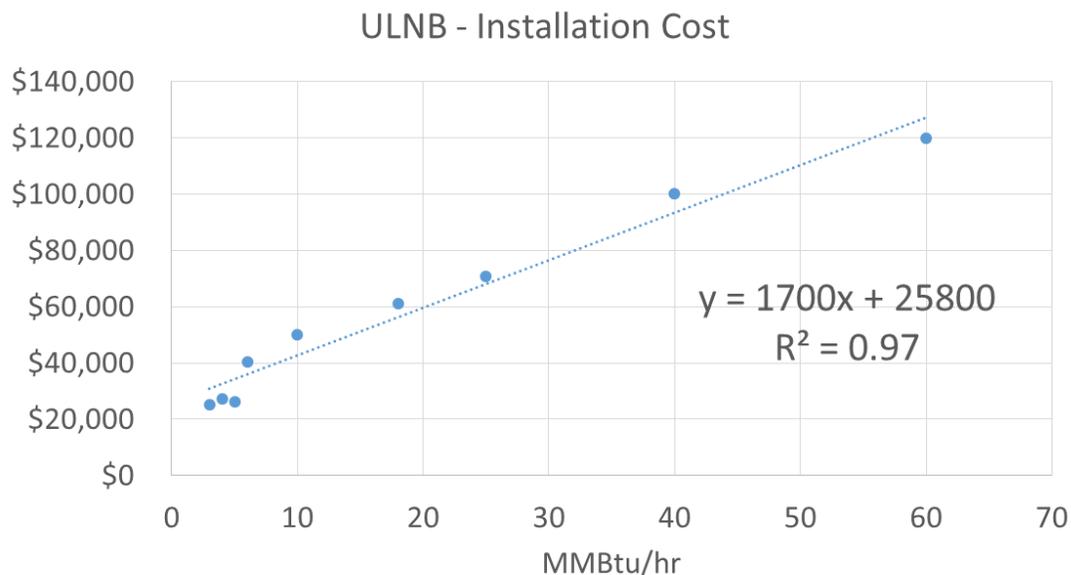
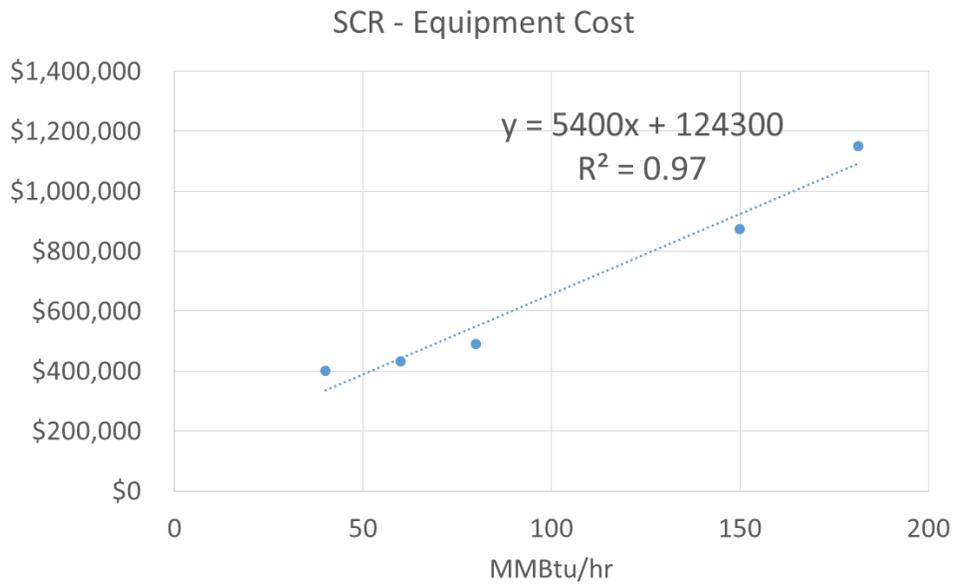


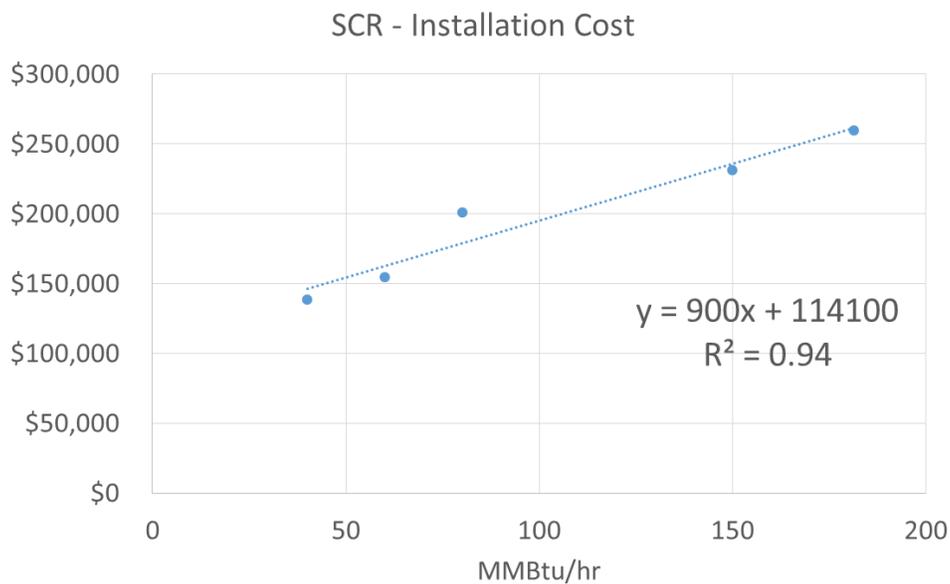
Figure 4
Equipment Cost (9 ppm Ultra-Low NOx Burner Replacements)



**Figure 5
Installation Cost (9 ppm Ultra-Low NO_x Burner Replacements)**



**Figure 6
Equipment Cost (5 ppm SCR Retrofits)**



**Figure 7
Installation Cost (5 ppm SCR Retrofits)**

The cost-effectiveness analysis assumed an additional cost for the equipment of a 7 ppm ultra-low NO_x burner replacement. This additional equipment cost was assumed to be for the additional

controls needed, such as variable frequency drive and oxygen trim sensors, in comparison to a 9 ppm ultra-low NOx burner. It was assumed that the additional equipment cost for a 7 ppm ultra-low NOx burner varied by equipment size. Therefore, the additional equipment cost that were added to the cost of the 9 ppm ultra-low NOx burner for a 7 ppm ultra-low NOx burner was approximately \$3,000 for Rule 1146.1 units, \$10,000 for Rule 1146 Group III units, and \$21,000 for Rule 1146 Group II units.

Figures 8 and 9 below summarize the average capital cost that was included in the cost-effectiveness analysis for ultra-low NOx burners and SCR retrofits, respectively. The capital cost in the cost-effectiveness analysis for ultra-low NOx burner replacements, which included the equipment, installation, and permitting costs, was based on 7 ppm and 9 ppm for Rule 1146 Group III and Rule 1146.1 units, where 55% of the units were fire-tube boilers required to meet 7 ppm and 45% were non fire-tube boilers required to meet 9 ppm. For Rule 1146 Group III, the average capital cost was based on the equipment, installation, and permitting cost of a 6, 10, and 18 MMBtu/hr unit. For Rule 1146.1, the average capital cost was based on the equipment, installation, and permitting cost of a 3, 4, and 5 MMBtu/hr unit. The capital cost for atmospheric units and thermal fluid heaters was based on the equipment, installation, and permitting cost of a 2, 5, and 10 MMBtu/hr unit and a 12 ppm NOx emission limit. The average capital cost for Rule 1146.2 units was based on the equipment and installation cost of a 0.4, 1, and 2 MMBtu/hr unit and a 30 ppm NOx emission limit. The average capital cost in the cost-effectiveness analysis for SCR retrofits, which included the equipment, installation, and permitting costs, was based on Rule 1146 Group I and Group II units required to meet a 5 ppm NOx emission limit. The average rated heat input capacity that was used to determine the average capital cost for Rule 1146 Group I was 181.3 MMBtu/hr. The average capital cost for Rule 1146 Group II was based on the equipment, installation, and permitting cost of a 25, 40, and 60 MMBtu/hr unit. For a 25 MMBtu/hr unit, the SCR equipment and installation costs were conservatively assumed to be the same as that of a 40 MMBtu/hr unit.

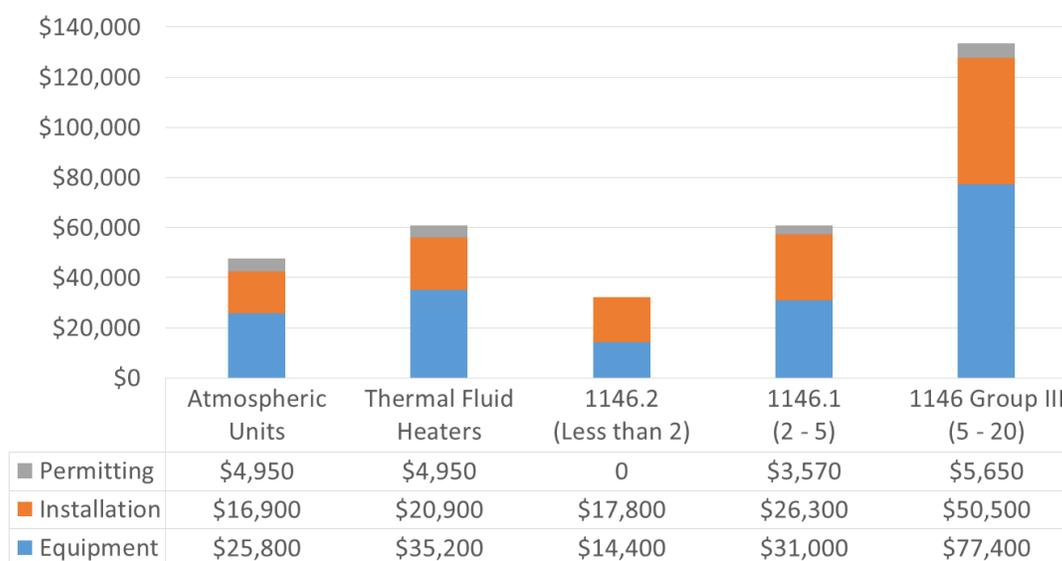


Figure 8
Capital Cost (Ultra-Low NOx Burner Replacements)

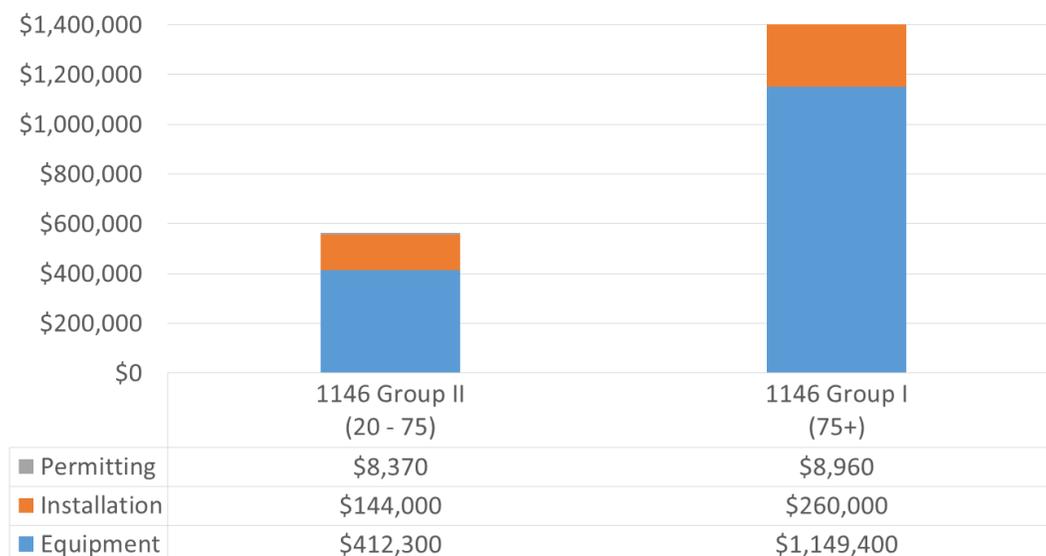


Figure 9
Capital Cost (SCR Retrofits)

The recurring expenses included in the annual cost were additional electrical, O&M, and monitoring expenses, as well as ammonia and catalyst consumption that are not already required for the existing operation. Additional details of the annual costs that were included in the cost-effectiveness analysis are provided in the following sections.

Additional Electrical Cost

For retrofits with ultra-low NO_x burner replacements, the potential cost increase for electricity is from the use of flue gas recirculation (FGR), which requires additional energy due to the higher dilution. However, there are potential savings gained with a new burner since the new burner would have greater efficiency and higher turndowns compared to the older burner. Additionally, the installation of variable frequency drive (VFD) and oxygen sensors can reduce the electrical cost. Therefore, the cost-effectiveness analysis for retrofits with ultra-low NO_x burner replacements does not account for additional electrical cost. For SCR retrofits, there will be a cost increase due to the additional energy consumption required for the higher pressure drop, ammonia vaporization, and induction fan associated with the SCR system. The additional energy consumption was calculated using the U.S. EPA SCR Cost Manual, where the estimated power consumption (kW) for the SCR system depended on the unit's rated heat input capacity (MMBtu/hr). The cost was determined assuming a 50% operating capacity and an industrial electricity rate of 12.68 cent per kW-hr⁸. The additional electrical cost included in the cost-effectiveness analysis was approximately \$11,900 for Rule 1146 Group II units and \$51,800 for Rule 1146 Group I units.

Although, there are additional electrical cost with an SCR system, there are potential savings for units currently using FGR. After installing SCR, units that currently use FGR could reduce or eliminate the use of FGR, since the NO_x emissions could primarily be control by the SCR system rather than with FGR. Therefore, savings based on the number of existing non-compliant units

⁸ U.S. Energy Information Administration Electric Power Monthly Reports (data for the monthly price of electricity for industrial sector in California was used to calculate the annual average for the months of June 2017 – June 2018)

with FGR was accounted for when calculating the potential increase in electrical cost. Approximately 47 units between 20 and 75 MMBtu/hr and 3 units greater than 75 MMBtu/hr currently use FGR. The savings were estimated by calculating the annual electrical cost for the energy consumption of FGR based on the average heat input of the burners in Group I and Group II of Rule 1146. The total savings applied in the cost-effectiveness analysis was assumed to be the difference in electrical cost from the reduction in FGR utilization⁹ of 30% down to 15%. This potential savings in electrical cost (based on a 20% operating capacity and an industrial electricity rate of 12.68 cent per kW-hr) for each non-compliant unit utilizing FGR was distributed among the total number of non-compliant units in each group category. The number of non-compliant Rule 1146 units for Group II and Group I was 52 and 3, respectively. The FGR savings included in the cost-effectiveness analysis was approximately \$3,000 for Rule 1146 Group II units and \$14,700 for Rule 1146 Group I units.

Ammonia and Catalyst Cost

SCR uses catalyst and ammonia to selectively reduce NO_x. Ammonia is injected into the flue gas stream where it reacts with NO_x and oxygen within the catalyst to produce nitrogen and water vapor. The U.S. EPA SCR Cost Manual was used to estimate, based on the unit's rated heat input and a 50% operating capacity, the consumption rate of ammonia and the catalyst volume required to reduce NO_x emission from 30 ppm down to 5 ppm with an ammonia slip limit of 5 ppm. The average price of 19% aqueous ammonia obtained from two suppliers was used to determine the recurring cost for the SCR ammonia consumption. The additional recurring annual cost for ammonia that was included in the cost-effectiveness analysis was approximately \$5,400 for Rule 1146 Group II units and \$23,100 for Rule 1146 Group I units.

As for the catalyst, according to discussions with vendors, the catalyst replacement frequency is between 7 to 12 years. Therefore an average replacement frequency of 9 years and a catalyst replacement cost of \$258.80 per cubic foot¹⁰ was assumed to estimate the recurring catalyst cost. The additional recurring annual cost for the catalyst consumption that was included in the cost-effectiveness analysis was approximately \$3,200 for Rule 1146 Group II units and \$13,900 for Rule 1146 Group I units.

Additional O&M Cost

For the O&M cost included in the cost-effectiveness analysis was only the recurring annual cost for labor and materials that are not already part of the existing operations. Existing burners already have service contracts in place, plus there would most likely be less maintenance and fewer repairs for the retrofit burner. Also, additional controls, such as oxygen sensors for oxygen trim would reduce the combustion tuning frequency of a burner without these controls. The oxygen sensors have typical lifespans of 10 – 15 years similar to the ultra-low NO_x burners. Therefore no additional O&M cost were accounted for in the cost-effectiveness analysis for retrofits with ultra-low NO_x burner replacements. For a retrofit with an SCR system, there will be additional O&M costs compared to a unit with no SCR. The additional O&M cost associated with SCR retrofits accounted for the recurring expense of annual SCR maintenance checks. According to the U.S. EPA SCR Cost Manual, the annual maintenance labor and material cost for an SCR system was assumed to be 0.5% of equipment and installation cost. The additional O&M cost that was

⁹ Electrical use for FGR utilization was estimated using data from the chart available at: <https://www.preferred-mfg.com/assets/documents/Combustion%20Control%20Strategies.pdf>

¹⁰ December 2015 Staff Report for NO_x RECLAIM Amendments to Regulation XX – Regional Clean Air Incentives Market (RECLAIM)

included in the cost-effectiveness analysis was approximately \$2,800 for Rule 1146 Group II units and \$7,100 for Rule 1146 Group I units.

Additional Monitoring Cost

Emissions monitoring was considered separately from the O&M cost. The monitoring cost included in the cost-effectiveness analysis was the additional cost for monitoring, reporting, and recordkeeping (MRR) that is not already required for the existing operations. RECLAIM or former RECLAIM Title V facilities will continue with their current MRR requirements specified in Rule 2012, whereas non-Title V facilities would transition to the command-and-control landing rule requirements. Except for reporting requirements, the MRR requirements for Rule 2012 are comparable to command-and-control MRR requirements for Rules 1146 and 1146.1. Since the MRR requirements will either remain the same or be similar to the existing requirements, no additional monitoring cost was considered in the cost-effectiveness analysis for ultra-low NOx burner retrofits. On the other hand, since SCR systems will have an ammonia emission limit, there will be additional monitoring cost due to ammonia slip tests. The additional monitoring costs will require quarterly ammonia testing in the first year of operation and then annually thereafter when four consecutive quarterly source tests demonstrate compliance. The ammonia slip source test was estimated to be \$3,333 per year based on information obtained from discussions with vendors.

For RECLAIM facilities, substantial reporting requirements are currently required pursuant to Rule 2012, and the transition into a command-and-control rule would not impose additional monitoring costs. Instead, since RECLAIM has extensive reporting requirements, as discussed in Appendix A, it is anticipated that there might be potential cost savings in MRR for some facilities by transitioning into the command-and-control rule. For instance, RECLAIM facilities are required to electronically report their emissions daily for major source units, monthly for large source units and quarterly for other units, in addition to the quarterly certification of emissions and annual permit emissions reports. In contrast, Rule 1146 only requires units with CEMS to report their emissions once every 6 months pursuant to Rule 218 – Continuous Emission Monitoring. The potential savings due to the change in reporting requirements as they transition from RECLAIM to Rule 1146 was estimated based on the approximated annual staffing cost that would be needed to fulfill RECLAIM reporting requirements. The potential savings were approximated to be \$40,000 and \$2,000 per piece of major and non-major sources, respectively. However, at this time these potential savings were not included in the cost-effectiveness analysis since no change is being proposed to the reporting requirements for Title V facilities and aggregate savings for Non-Title V facilities are minimal. Additionally, since the annual heat input threshold for CEMS applicability is lower in RECLAIM, it is possible that a piece of 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. However, due to the uncertainty in quantifying the potential cost savings for facilities impacted by the change in the CEMS applicability threshold as they transition from RECLAIM into Rule 1146, this potential savings was not included in the cost-effectiveness analysis.

The cost-effectiveness values presented in this analysis and summarized below in Table 4, differ slightly from that of the Draft Socioeconomic Impact Assessment (SIA) for PAR 1146 series and PR 1100. The analysis used in the Draft SIA assumes a staggered implementation costs from 2020 to 2023 where 75% of capital costs are assumed in the first year, 20% in the second year, and 5% in the final year of implementation. Additionally, cost effectiveness calculations will differ based on whether the Discounted Cash Flow (DCF) or Levelized Cash Flow (LCF) method was used.

Table 4
Cost-Effectiveness Analysis

Category	Size (MMBtu/hr)	Recommended Emission Limit	Present Worth Value per unit	Reductions* (tpy)	Control Technology useful life	Cost-effectiveness (\$/ton)
1146 Group I	≥ 75	5 ppm (existing limit)	\$2,765,000	16	SCR – 25 yrs	\$21,000
1146 Group II	≥20 to <75	5 ppm	For units > 12 ppm*			
			\$960,000	56	SCR – 25 yrs	\$36,000
		7 ppm for fire-tube boilers	\$21,000	1.72	ULNB – 15 yrs	\$11,000
1146 Group III	≥5 to <20	7 ppm for fire-tube boilers (9 ppm for others)	For units > 12 ppm*			
			\$134,000	22.6	ULNB – 15 yrs	\$28,000
		\$10,000	1.88	ULNB – 15 yrs	<\$10,000	
1146.1	≥2 to <5	Same as above	For units > 12 ppm*			
			\$61,000	2.18	ULNB – 15 yrs	\$36,000
			\$3,000	0.19	ULNB – 15 yrs	<\$10,000
1146.2	<2	30 ppm (existing limit)	\$33,000	0.95	ULNB – 15 yrs	<\$10,000
Atmospheric Units	≤10	12 ppm (existing limit)	\$143,000	0.34	ULNB – 15 yrs	\$29,000
Thermal Fluid Heaters	NA	12 ppm	\$183,000	0.34	ULNB – 15 yrs	\$36,000

* Estimated using emissions from RECLAIM units

^ Estimated assuming 20% operating capacity and a baseline of 30 ppm

Estimated assuming retrofit to meet 20 ppm

Rules 1146 and 1146.1 include a provision for units that operate with low fuel usage. The low fuel use provisions limit annual fuel usage to <90,000 therms/year and <18,000 therms/year for Rule 1146 (c)(5) and Rule 1146.1 (c)(4), respectively. Although it is technically feasible for low fuel use units to retrofit to meet the BARCT emission limits, the resulting emission reductions would be low resulting in the retrofit being not as cost effective (> \$50,000 per ton of NOx reduced). For example, the cost-effectiveness for a 10 MMBtu/hr water-tube boiler operating at 90,000 therms/year to meet the BARCT emission limit of 9 ppm is about \$56,000/ton. For the same boiler with a fuel usage of 45,000 therms/year, the cost-effectiveness is approximately \$112,000/ton. Due to their lower operations and potential emission reductions, it is not cost effective to require immediate retrofits for low use units to meet the BARCT emission limits.

Incremental Cost-effectiveness

H&SC Section 40727.2 requires an incremental cost-effectiveness analysis for BARCT rules or emission reduction strategies when there is more than one control option which would achieve the emission reduction objective of the proposed amendment, relative to ozone, CO, SOx, NOx, and their precursors. Incremental cost-effectiveness is defined as the difference in control cost divided by the difference in emission reductions between two potential control options that can achieve the same emission goal or a regulation.

The incremental cost-effectiveness for PAR 1146 and 1146.1 was calculated assuming that units between 5 and 75 MMBtu/hr currently complying with a NOx emission limit of 12 ppm or less would be required to meet a more stringent 5 ppm NOx limit with SCR retrofits instead of instead of the proposed limits (7 ppm for fire-tube boilers or 9 ppm for all others) by 15 years after the date of the proposed amendment or when 50 percent or more of the unit's burners are replaced, whichever is earlier. As shown in the Table 5 below, the incremental cost-effectiveness ranged from \$290,976 per tons of NOx reduced for units between ≥20 and <75 MMBtu/hr to \$1,472,777 per tons of NOx reduced for units between ≥5 to <20 MMBtu/hr.

Table 5
Incremental Cost-effectiveness

Group	Size (MMBtu/hr)	Current Proposal	Alternative	Incremental Cost-Effectiveness
Rule 1146 Group II	≥20 to <75	For units > 12 ppm	None	Not Applicable
		5 ppm via SCR		
		For units ≤ 12 ppm	5 ppm via SCR	\$290,976
Rule 1146 Group III	≥5 to <20	7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers	5 ppm via SCR	\$1,472,777

Since the emissions limits for the PAR 1146.2 remain the same as the existing rule requirements, an estimate of the incremental cost-effectiveness for the proposed amendments to Rule 1142 relied upon the analysis conducted during the 2006 amendment to Rule 1146.2. In the 2006 amendment to Rule 1146.2, the incremental cost-effectiveness for the larger Type 2 units meeting a lower NOx emission limit of 12 ppm / 20 ppm from 30 ppm was analyzed. The incremental cost-effectiveness was about \$2,400 per ton of NOx reduced for meeting the 20 ppm limit and \$24,100 per ton of NOx reduced for meeting the 12 ppm limit. The incremental cost-effectiveness between NOx emission limits of 20 ppm and 12 ppm was about \$43,600 per additional ton reduced. After adjusting for inflation between 2006 and 2017, the updated incremental cost-effectiveness ranged from roughly \$2,700 to \$27,000 per tons of NOx reduced for meeting the 20 ppm and 12 ppm respectively.

Summary of NOx BARCT Emission Limit

Staff's preliminary recommendation for the BARCT emission limits are established using information gathered from existing SCAQMD regulations, existing permitted units located in SCAQMD, regulatory requirements for other air districts, existing permitted units located in other air districts, the technology assessment, and considerations for application specific limitations. Both retrofits and new installations are considered. After considering the cost-effectiveness, staff recommendations for NOx BARCT can be found in the table below:

**Table 6
Staff’s Preliminary Recommendations for NOx BARCT**

Unit Description	Recommended NOx Emission Limits and Compliance Dates			
Rule 1146	Units >5 ppm	Units ≤5 ppm	Compliance Date >5 ppm	Compliance Date ≤5 ppm
≥75 MMBtu/hour (Rule 1146 Group I)	5 ppm via SCR (same as existing limit)	In compliance with rule limit	75% of 1146 & 1146.1 units by Jan 2021 100% of 1146 & 1146.1 units by Jan 2022 Replacement by Jan 2023	No Action Needed
Rule 1146 and 1146.1	Units >12 ppm	Units ≤12 ppm	Compliance Date >12 ppm	Compliance Date ≤12 ppm
≥20 to <75 MMBtu/Hour (Rule 1146 Group II)	5 ppm via SCR	Fire-tube: 7 ppm via ULNB Others: 9 ppm via ULNB	Same as above	Burner replacement or 15 yrs after amendment (for both RECLAIM and non-RECLAIM)
≥5 to <20 MMBtu/Hour (Rule 1146 Group III)	Fire-tube: 7 ppm via ULNB Others: 9 ppm via ULNB	Fire-tube: 7 ppm via ULNB Others: 9 ppm via ULNB		
>2 to <5 MMBtu/Hour (Rule 1146.1)				
Atmospheric Units ≤10 MMBtu/Hour	12 ppm via ULNB (same as existing limit)	In compliance with rule limit		No Action Needed
Thermal Fluid Heaters	Units >20 ppm	Units ≤20 ppm	Compliance Date >20 ppm	Compliance Date ≤20 ppm
All Sizes	12 ppm via ULNB	12 ppm via ULNB	Same as above for RECLAIM facilities Jan 2022 for non-RECLAIM facilities	Burner replacement or 15 yrs after amendment (for both RECLAIM and non-RECLAIM)

CONTROL TECHNOLOGY ASSESSMENT FOR RULE 1146.2 EQUIPMENT

As part of the technology assessment under the 2006 amendment for Rule 1146.2, source test reports conducted for the Rule 1146.2 Certification Program were analyzed to assess the advancement in pollution control technologies. It was found that low-NO_x burners for boilers and heaters in this size range can achieve less than 10 ppm NO_x (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 NO_x, indicating that Type 2 units are capable of meeting a lower emission level at 12 ppm. Although a lower NO_x 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 in 2006, the 20 ppm emission limit was proposed and adopted in the 2006 amendment.

Analysis of NO_x Concentration Limits for Rule 1146.2 Equipment at Other Air Districts

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

- SJVAPCD Rule 4308 Boilers, Steam Generators, and Process Heaters – 0.075 MMBtu/hr to Less Than 2.0 MMBtu/hr
- SMAQMD Rule 411 NO_x 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 analogous rules and found no requirements that were more stringent than those already in Rule 1146.2.

Summary of BARCT Technology Assessment for Rule 1146.2

Based on the above information, there is a potential opportunity to lower the NO_x concentration emission limit for Rule 1146.2. However, amending the NO_x concentration limit will affect both RECLAIM and non-RECLAIM sources, and requires a much 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 NO_x concentration limit for Rule 1146.2 equipment at this time. Staff is committed to return to Rule 1146.2 to further assess the advancement and the cost-effectiveness of advanced control technologies for this source category.

CHAPTER 3: SUMMARY OF PROPOSALS

INTRODUCTION

PROPOSED AMENDED RULE 1146

PROPOSED AMENDED RULE 1146.1

PROPOSED AMENDED RULE 1146.2

PROPOSED RULE 1100

TRANSITION LOGISTICS

INTRODUCTION

The primary objectives of PARs 1146, 1146.1, and 1146.2 are to establish NOx limits that represent BARCT requirements for equipment regulated under these rules and to remove the exclusion of RECLAIM facilities. Additional definitions and provisions were needed to clarify the revised requirements for the applicable facilities. The key revisions to the rules are discussed below.

PROPOSED AMENDED RULE 1146

Rule 1146 Applicability (Subdivision (a))

Rule 1146 applies to boilers, steam generators, and process heaters of equal to or greater than 5 MMBtu/hr of rated heat input capacity used in all industrial, institutional, and commercial operations and currently exempts power generating boilers at electricity generating facilities (EGFs), boilers and process heaters with a rated heat input capacity greater than 40 MMBtu/hr 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 and move these exemptions from subdivision (a) – Applicability to a new subdivision (f) – Exemptions.

Rule 1146 Definitions (Subdivision (b))

The following definitions were added to Rule 1146 to distinguish different boiler types, facility types, and consistently define the meaning of modification.

FIRE-TUBE BOILER in paragraph (b)(7), which means:

“any boiler that passes hot gases from a fire box through one or more tubes running through a sealed container of water. The heat of the gases is transferred through the walls of the tubes by thermal conduction, heating the water and ultimately creating steam.”

FORMER RECLAIM FACILITY in paragraph (b)(8), which means:

“a facility, or any of its successors, that was in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program.”

MODIFICATION in paragraph (b)(16), which means:

“any physical change that meets the criteria set forth in Rule 1302 – Definitions.”

MUNICIPAL SANITATION SERVICES in paragraph (b)(17), which means:

“basic sanitation services provided to the residents of a municipality by sewage treatment plants and municipal solid waste landfills”

NON-RECLAIM FACILITY in paragraph (b)(18), which means:

“a facility, or any of its successors, that was not in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX.”

RECLAIM FACILITY in paragraph (b)(23), which means:

“a facility, or any of its successors, that is currently in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX.”

The following definitions were deleted from Rule 1146 since they were no longer referred to in this rule.

ANNUAL CAPACITY FACTOR

STANDBY BOILER

Rule 1146 Requirements (Subdivision (c))

Prior to this amendment, RECLAIM facilities were not required to comply with the command-and-control NO_x emission limits in Rule 1146 because of the exemption specified in subdivision (j) of Rule 2001 and paragraph (a)(4) of the current Rule 1146. In order to remove this exemption, subdivision (c) will have the following notwithstanding clause:

“Notwithstanding the exemptions contained in Rule 2001 – Applicability, Table 1 – Rules Not Applicable to RECLAIM Facilities for Requirements Pertaining to NO_x Emissions If Rule was Adopted or Amended Prior to October 5, 2018, the owner or operator of any unit(s) subject to this rule shall not operate the unit in a manner that exceeds the emission limits specified in paragraphs (c)(1), (c)(2), (c)(3), and (c)(4).”

RECLAIM and former RECLAIM facilities with equipment subject to Rule 1146 will be required to comply with the proposed NO_x emission limit that is specified in paragraph (c)(1) based on the applicable category in Table 1146-1, which represents current BARCT. The implementation schedule will be detailed in PR 1100, as specified in subparagraph (e)(1).

The NO_x emission limits are presented in Table 7 which is also in PAR 1146 Table 1146-1 – NO_x Emission Limits and Compliance Schedule. This table changed for certain units in Group II, Group III, and thermal fluid heaters from Table 1146-1 in the current Rule 1146. The table was also updated to remove the columns specifying dates for submittal of compliance plans and permit applications. Also removed was the criteria for the previously required compliance plans that was specified in paragraph (c)(9).

The enhanced compliance limits for Group II units specified in Table 1146-2 and paragraph (c)(2) in the current Rule 1146 were removed. These enhanced limits and compliance dates are no longer applicable to the proposed amendment, given that the compliance dates have passed and that the standard limit for Group II has been revised in Table 1146-1 to 5 ppm or 0.0062 lbs/10⁶ Btu. However, an existing Group II unit meeting 5 ppm based on the prior Enhanced Compliance Limits and Schedule in Table 1146-2 of the current Rule 1146 would still be required to meet 5 ppm. Group II units complying with 5 ppm would be subject to subparagraph (c)(1)(I) of the proposed amended rule, since such a unit would be excluded from subparagraph (c)(1)(G) or (c)(1)(H) given that the previous NO_x limit prior to the date of amendment must be greater than 5 ppm for these subparagraphs to be applicable.

Paragraph (c)(2) was replaced to specify an ammonia slip limit as follows:

“The owner or operator of any unit(s) operating with air pollution control equipment that results in ammonia emissions in the exhaust shall not discharge into the atmosphere ammonia emissions in excess of 5 ppm (referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 60 consecutive minutes), except for units complying with paragraph (c)(8).”

The ammonia emission limit of 5 ppm is consistent with the current BACT limit and would apply to units that are installed or modified on or after the date of the proposed amendment. As specified in paragraph (c)(8), existing non-RECLAIM units installed or modified prior to the proposed

amendment that are currently permitted with an ammonia emission limit greater than 5 ppm do not have to meet the ammonia emission limit in paragraph (c)(2) until the air pollution control equipment is replaced or modified.

Table 7
Rule 1146-1 – NO_x Emission Limits and Compliance Schedule

Rule Reference	Category	Limit¹	Compliance Schedule for Non-RECLAIM Facilities	Compliance Schedule for RECLAIM and Former RECLAIM Facilities
(c)(1)(A)	All Units Fired on Gaseous Fuels	30 ppm or for natural gas fired units 0.036 lbs/10 ⁶ Btu	September 5, 2008	See Rule 1100 – Implementation Schedule for NO _x Facilities
(c)(1)(B)	Any Units Fired on Non-gaseous Fuels	40 ppm	September 5, 2008	
(c)(1)(C)	Any Units Fired on Landfill Gas	25 ppm	January 1, 2015	
(c)(1)(D)	Any Units Fired on Digester Gas	15 ppm	January 1, 2015	
(c)(1)(E)	Atmospheric Units	12 ppm or 0.015 lbs/10 ⁶ Btu	January 1, 2014	
(c)(1)(F)	Group I Units	5 ppm or 0.0062 lbs/10 ⁶ Btu	January 1, 2013	
(c)(1)(G)	Group II Units (Fire-tube boilers with a previous NO _x limit ≤ 12 ppm and > 5 ppm prior to [date of amendment])	7 ppm or 0.0085 lbs/10 ⁶ Btu;	See (c)(7)(A)	
(c)(1)(H)	Group II Units (All others with a previous NO _x limit ≤ 12 ppm and > 5 ppm prior to [date of amendment])	9 ppm or 0.011 lbs/10 ⁶ Btu	January 1, 2014 or See (c)(7)(A)	
(c)(1)(I)	Group II Units (All others)	5 ppm or 0.0062 lbs/10 ⁶ Btu	Date of amendment	
(c)(1)(J)	Group III Units (Fire-tube boilers only)	7 ppm or 0.0085 lbs/10 ⁶ Btu	Date of amendment or See (c)(7)(B)	
(c)(1)(K)	Group III Units (All others)	9 ppm or 0.011 lbs/10 ⁶ Btu	January 1, 2015 or See (c)(7)(B)	
(c)(1)(L)	Thermal Fluid Heaters	12 ppm or 0.015 lbs/10 ⁶ Btu	Date of amendment or See (c)(7)(C) for units with a previous NO _x limit ≤ 20 ppm prior to [date of amendment] or See (e)(2) for units with a previous NO _x limit >20 ppm prior to [date of amendment]	

¹All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.

Requirements for Low-Fuel Use Units

Paragraph (c)(5), which contains provisions for non-RECLAIM low-fuel usage units that have been in operation prior to September 5, 2008, was extended to also apply to low-fuel usage units at a RECLAIM or former RECLAIM facility that are in operation prior to the 12 months after the date of the proposed amendment with an heat input less than or equal to 9.0×10^9 Btu (90,000 therms) per year. Pursuant to paragraph (e)(3), any owner or operator that complies with the alternative compliance option specified in paragraph (c)(5) will be subject to a NOx emission limit of 12 ppm 15 years after the date of amendment or when 50 percent or more of the unit's burners are replaced, whichever is earlier.

On or after January 1, 2015 or until burner replacement is the compliance schedule for non-RECLAIM low-fuel use units that is currently specified in paragraph (e)(3) in the current Rule 1146. Since this date has passed, compliance until burner replacement will be retained, but a definite timeframe of 15 years after amendment of the rule is now included for non-RECLAIM, RECLAIM or former RECLAIM facilities.

Requirements for Units Complying with a NOx Emission Limit of 12 ppm or less (or Thermal Fluid Heaters Complying with a NOx Emission Limit of 20 ppm or less)

In the 2008 amendments of Rules 1146 and 1146.1, a provision was included for natural gas units ranging from 2 to 20 MMBtu/hr to comply with the BARCT emission limits until the unit's burner(s) replacement, if the units complied with the then-applicable BACT limit of 12 ppm and were installed prior to the 2008 amendments. The provision was specified in Rule 1146 (c)(7) and Rule 1146.1 (c)(6), respectively (November 1, 2013 amendment).

Currently, there are a total of 97 RECLAIM units between 2 and 75 MMBtu/hr with complying with NOx emission limit between 9 and 12 ppm. The reported emissions for these 97 units in 2016 totaled to 0.058 tpd of NOx. If these units were required to meet the proposed NOx concentration limits of (7 ppm for fire-tube boilers and 9 ppm for all others), the estimated emission reductions would be 0.0063 tpd. Units currently complying with a 12 ppm NOx emission limit were either retrofitted or required to meet a specific emission limit to meet BACT if the unit was new. Assuming a useful equipment life of 15 years for ultra-low NOx burners, the majority of these units might not have met their full useful life by the compliance date under PR 1100. Since it is not cost effective to require immediate retrofits for these units, a future compliance timeframe will be specified, as shown below, in Rule 1146 paragraph (c)(7) for units between 5 and 75 MMBtu/hr currently complying with a NOx emission limit between 5 and 12 ppm and thermal fluid heaters complying with a NOx emission limit of 20 ppm or less. These units will have to meet the applicable NOx emission limit by a date that is 15 years after the date of the proposed amendment or when 50 percent or more of the unit's burners are replaced. For units with multiple burners, each successive burner replacement after the date of rule amendment shall be added to the cumulative percentage of burners replaced. The same compliance timeframe will be specified in PR 1100 for units between 2 and 75 MMBtu/hr currently complying with a NOx emission limit of 12 ppm or less and thermal fluid heaters complying with a NOx limit of 20 ppm or less at a RECLAIM or former RECLAIM facility.

- “(7) Notwithstanding paragraph (c)(1), *an owner or operator that has installed, modified, or has been issued a SCAQMD Permit to Construct or Permit to Operate for the following units prior to [date of amendment], at a non-RECLAIM facility, shall meet the NOx emission limit specified in Table 1146-1 by [15 years after the date of amendment] or when 50 percent or more of the unit's burners are replaced, whichever is earlier:*

- (A) *Group II units subject to subparagraph (c)(1)(G) or (c)(1)(H) complying with a previous NOx emission limit that is less than or equal 9 ppm and greater than 5 ppm; or*
- (B) *Group III units subject to subparagraph (c)(1)(J) or (c)(1)(K) complying with a previous NOx emission limit that is less than or equal to 12 ppm; or*
- (C) *Thermal fluid heaters subject to subparagraph (c)(1)(L) complying with a previous NOx emission limit that is less than or equal to 20 ppm.”*

Requirements for Biogas Units

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 each applicable compliance date for the selected unit under PR 1100 for units located at a RECLAIM or former RECLAIM facility.

Requirements for Units at a Municipal Sanitation Service Facility

As discussed above, because of the inherent challenges for units at a municipal sanitation service facility, such as sewage treatment plants and solid waste landfills, the existing NOx emission limits in the current Rule 1146 will be retained for these units. The proposed 7 ppm NOx limit for Group II and Group III units or 12 ppm NOx limit for thermal fluid heaters specified in Table 1146-1 will not apply to units at a municipal sanitation service facility. These units will instead continue to meet the existing NOx limits as specified in paragraph (c)(11):

- “(11) Notwithstanding the NOx emission limits specified in Table 1146-1 of paragraph (c)(1), an owner or operator shall not operate units at a municipal sanitation service facility in a manner that discharges NOx emissions (referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes) in excess of:*
- (A) 9 ppm for Group II and Group III units; or*
 - (B) 9 ppm, upon burner replacement, for Group III units that were installed or modified prior to September 5, 2008 complying with a previous NOx emission limit of 12 ppm or less shall; or*
 - (C) 30 ppm for thermal fluid heaters; or.*
 - (D) 30 ppm, upon burner replacement, for any low-fuel use unit complying with paragraph (c)(5).”*

Rule 1146 Compliance Determination (Subdivision (d))

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 SCAQMD 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) specifies the periodic monitoring for NOx emissions that each owner or operator of units subject to paragraphs (c)(1), (c)(2), or (c)(4) must conduct. Subparagraph (d)(8)(B) specifies the schedule for performing the diagnostic NOx emissions checks for low-fuel use units complying with the

requirements specified in paragraph (c)(5). In the current Rule 1146, the schedule for performing the diagnostic emission checks for low-fuel units at a non-RECLAIM facility is on or after January 1, 2015 or during burner replacement, whichever occurs later. Since this date has passed and low-fuel units at a non-RECLAIM facility are currently complying with diagnostic NO_x emissions checks according to the tune-up schedule specified in subparagraph (c)(5)(B), subparagraph (d)(8)(B) will state:

“The owner or operator of units complying with the requirements specified in paragraph (c)(5) shall check NO_x emissions according to the tune-up schedule specified in subparagraph (c)(5)(B).”

For units at a RECLAIM or former RECLAIM facility the NO_x emissions checks pursuant to subparagraph (d)(8)(B) will be required according to the schedule for the selected unit under PR 1100 .

Compliance Demonstration for Ammonia Emissions

Paragraph (d)(3) was replaced with the compliance demonstration requirements for the ammonia emission limit specified in paragraph (c)(2). The compliance demonstration for ammonia emissions will be quarterly source testing for the first 12 months of operation and annually thereafter when four consecutive quarterly source tests demonstrate compliance, or in lieu of source testing, an ammonia Continuous Emission Monitoring System (CEMS) under an approved SCAQMD protocol.

“(3) An owner or operator of a unit subject to the ammonia emission limit specified in paragraph (c)(2) shall:

- (A) Conduct quarterly a source test to demonstrate compliance with the ammonia emission limit, according to the procedures in District Source Test Method 207.1 for Determination of Ammonia Emissions from Stationary Sources, during the first 12 months of unit operation and annually within 12 months thereafter when four consecutive quarterly source tests demonstrate compliance with the ammonia emission limit. If an annual test is failed, four consecutive quarterly source tests must demonstrate compliance with the ammonia emissions limits prior to resuming annual source tests; or*
- (B) Utilize ammonia CEMS certified under an approved SCAQMD protocol to demonstrate compliance with the ammonia emission limit.”*

Monitoring, Reporting and Recordkeeping Requirements

Staff compared monitoring reporting and recordkeeping requirements for Rule 1146, 1146.1, and 1146.2 to the monitoring and reporting requirements under RECLAIM. The detailed comparison is provided in Appendix A of this staff report. In general, most monitoring and recordkeeping requirements under RECLAIM were similar to the corresponding command-and-control rule. The most substantive difference was the threshold for continuous emissions monitoring systems. Staff is currently working on adopting Proposed Rule 113 – Monitoring, Reporting, and Recordkeeping (MRR) Requirements for NO_x and SO_x Sources. Once PR 113 is adopted, all Rule 1146/1146.1 equipment will transition to PR 113 for MRR. In the interim, the intention of PAR 1146 series and PR 1100 is for Title V RECALIM facilities to retain RECLAIM MRR. A discussion of the requirements of monitoring, recordkeeping, and reporting requirements for RECLAIM and non-RECLAIM facilities is presented below.

Non-Major Sources in Non-Title V Facilities

The requirements in monitoring and recordkeeping are comparable between RECLAIM and those specified in Rule 1146, Rule 1146.1, and Rule 1146.2. Since mass emissions are used for RTC reconciliation and compliance determination, the reporting requirements in RECLAIM include both monthly/quarterly electronic reporting, and quarterly and annual paper reporting. The corresponding requirement in Rule 1146 is a semi-annual report only for equipment equipped with CEMS and subject to Rule 218 - *Continuous Emission Monitoring*. For facilities without CEMS, Rule 1146 applicable equipment must comply with periodic monitoring with the use of portable emission analyzers either monthly or every 750 operating hours, or quarterly or every 2000 operating hours. Given that the reporting requirements in RECLAIM were designed to ensure the integrity of the reported mass emissions, mass emission reporting requirements might not be needed if the facilities are subject to Rule 1146 series, which determine compliance through a concentration limit. As such, non-major sources in non-Title V facilities would 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). A 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, any units with a rated heat input capacity greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 billion Btu per year are required to have installed a continuous in-stack NO_x monitor (CEMS-equivalent) (Rule 1146 (c)(6)). A comparison between the applicability thresholds in Rule 1146 and the RECLAIM program is shown in Table 8.

Table 8
Applicability Thresholds of CEMS in Rule 1146 and RECLAIM

	Rule 1146	RECLAIM
Size	40 MMBtu/hr	40 MMBtu/hr
Annual Fuel Usage	200 Billion Btu/year	90 Billion Btu/year

Since the applicability threshold in annual heat input is lower in RECLAIM, it is possible that a piece of 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. As discussed previously, mass emissions reported by RECLAIM facilities are used to track and demonstrate compliance in the RECLAIM program. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements for major sources such as annual (or semi-annual) relative accuracy testing (RATA), daily emissions electronic reporting, quarterly aggregate electronic reporting, quarterly emissions reports (QCER), and annual emissions report (APEP). As RECLAIM facilities transition into an equipment-based command-and-control regulatory structure, to the extent possible, they should be subject to the same regulatory requirements as other non-RECLAIM facilities that are currently regulated by the respective

command-and-control rules. In particular, Rule 1146 was approved in the California State Implementation Plan (SIP) in 2014 (79 FR 57442). It was determined by EPA that Rule 1146 is consistent with the relevant policy and guidance as required under the Clean Air Act. Therefore, as RECLAIM facilities exit the RECLAIM program, PAR 1146 requires that Rule 1146 equipment at a former RECLAIM facility to be subject to the CEMS requirements in Rule 1146. In other words, a former non-Title V RECLAIM facility would be allowed to remove the CEMS that is equipped on a Rule 1146 unit, if the equipment size and annual heat input usage of the unit is lower than the CEMS applicability threshold as specified in Rule 1146.

To evaluate the potential impacts of the change in CEMS threshold as RECLAIM facilities transition into PAR 1146, the fuel usage records of RECLAIM units was retrieved for calendar year 2015 and 2016. Among the 18 units that exceed the equipment size threshold of ≥ 40 MMBtu/hr, one was defined as non-major sources under the RECLAIM program, as their annual heat inputs were less than the major source definition of 90 billion Btu per year as specified in Rule 2012 (c)(1). For this one, CEMS would not be required under both Rule 1146 or RECLAIM requirements. Fifteen of the 17 major source units reported fuel usage data in 2015 / 2016. Five of these units had an annual fuel usage that exceeded 200 billion Btu per year. These units would be required to be equipped with CEMS under both Rule 1146 and the RECLAIM program. A total of ten major source units reported fuel usage below 200 billion Btu per year with 7 units that reported fuel usage below 90 billion Btu per year, and 3 units reported fuel usage between 90 and 200 billion Btu per year. Although the annual heat input of these 7 major source units fall below the CEMS applicability threshold in Rule 1146, they are equipped with CEMS, as required by all major source units in RECLAIM. Therefore, these units might have higher fuel usage records before year 2015, which was not captured in this analysis. To be conservative, a total of 10 Rule 1146 major source units is estimated to be potentially impacted by the change in the CEMS applicability threshold as they transition from RECLAIM into Rule 1146, and they may potentially remove the CEMS currently equipped with the unit, dependent upon future fuel usage of each unit.

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. EPA defines a “major source” as a facility that emits, or has the potential to emit (PTE) any criteria pollutant or hazardous air pollutant (HAP) at levels equal to or greater than the Major Source Thresholds (MST), which may vary depending on the attainment status (e.g. marginal, serious, extreme) of the geographic area and the criteria pollutant or HAP in which the facility is located. 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. SCAQMD has developed guidelines, outlined in SCAQMD Periodic Monitoring Guidelines¹¹, for periodic monitoring, testing and recordkeeping requirements that may be incorporated in Title V permits. Currently, the monitoring requirements in the RECLAIM program are comprehensive and address the Title V periodic monitoring requirements. Therefore, RECLAIM Title V facilities will continue to comply with the monitoring, reporting, and recordkeeping requirements specified in Rule 2012 until PR 113 is adopted.

Rule 1146 Compliance Schedule (Subdivision (e))

Subdivision (e) contains the compliance schedule provisions for units at a RECLAIM or former RECLAIM facility and for thermal fluid heaters at a non-RECLAIM facility. Paragraph (e)(1)

¹¹ Periodic Monitoring Guideline. <http://www.aqmd.gov/home/permits/title-v/title-v-requirements#pm>.

references the compliance schedule specified in PR 1100 for RECLAIM or former RECLAIM facilities, since PR 1100 will contain the implementation schedules for the units that will be transitioning out of the RECLAIM program.

- “(1) The owner or operator of any unit(s) at a RECLAIM or former RECLAIM facility subject to paragraph (c)(1) shall meet the applicable NOx emission limit in Table 1146-1 in accordance with the schedule specified in Rule 1100 – Implementation Schedule for NOx Facilities.”*

As stated below, Paragraph (e)(2) will specify the compliance schedule for non-RECLAIM thermal fluid heaters. Permit applications will be due 12 months after rule amendment for units with a NOx emission limit greater than 20 ppm. These thermal fluid heaters will have to meet the proposed 12 ppm NOx limit by January 1, 2022.

- “(2) An owner or operator of a non-RECLAIM facility with any thermal fluid heaters with a NOx emission limit greater than 20 ppm shall:*
- (A) On or before [12 months after date of amendment], submit a complete SCAQMD permit application for each thermal fluid heater that does not currently meet the limit specified in subparagraph (c)(1)(L); and*
- (B) On or before January 1, 2022, meet the applicable NOx emission limit in Table 1146-1 for thermal fluid heaters subject to subparagraph (c)(1)(L).”*

Rule 1146 Exemptions (Subdivision (f))

A new subdivision was added to include rule exemptions, which in the current rule were stated in subdivision (a). For the proposed amended rule, the exemptions will be under subdivision (f) as follows:

- “(f) Exemptions*
- The provisions of this rule shall not apply to:*
- (1) boilers used by electric utilities to generate electricity; or*
- (2) boilers and process heaters with a rated heat input capacity greater than 40 million Btu per hour that are used in petroleum refineries; or*
- (3) sulfur plant reaction boilers; or*
- (4) any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category defined in Rule 1100 – Implementation Schedule for NOx Facilities; or*
- (5) any unit at a municipal sanitation service facility that is subject to a NOx emission limit in a different Regulation XI rule.”*

Units that are, or will be, covered by a rule for an industry-specific category and subject to an applicable NOx emission limit are exempted from this rule. Paragraph (f)(4) includes any unit at a RECLAIM or former RECLAIM facility covered in an industry-specific category as defined in PR 1100. Currently, this includes energy generating boilers at electricity generating facilities (EGFs) and refinery boilers with applicable NOx limits specified in the corresponding rule. Paragraph (f)(5) will include units at municipal sanitation service facility, which will have a sector specific rule specifying the applicable NOx emission limits for these units.

PROPOSED AMENDED RULE 1146.1**Rule 1146.1 Applicability (Subdivision (a))**

Rule 1146.1 applies to boilers, steam generators, and process heaters that are greater than 2 million Btu per hour and less than 5 million Btu 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 amendment to Rule 1146.1 will revise and move the exemption contained in subdivision (a) – Applicability to a new subdivision (f) – Exemptions.

Rule 1146.1 Definitions (Subdivision (b))

The following definitions were added to Rule 1146.1 to distinguish different boiler types, facility types, and consistently define the meaning of modification.

FIRE-TUBE BOILER in paragraph (b)(7), which means:

“any boiler that passes hot gases from a fire box through one or more tubes running through a sealed container of water. The heat of the gases is transferred through the walls of the tubes by thermal conduction, heating the water and ultimately creating steam.”

FORMER RECLAIM FACILITY in paragraph (b)(8), which means:

“a facility, or any of its successors, that was in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program.”

HEAT INPUT in paragraph (b)(10), which means:

“the chemical heat released due to assumed complete combustion of fuel in a unit, using the higher heating value of the fuel. This does not include the sensible heat of incoming combustion air.”

MODIFICATION in paragraph (b)(13), which means:

“any physical change that meets the criteria set forth in Rule 1302 – Definitions.”

MUNICIPAL SANITATION SERVICES in paragraph (b)(14), which means:

“basic sanitation services provided to the residents of a municipality by sewage treatment plants and municipal solid waste landfills.”

NON-RECLAIM FACILITY in paragraph (b)(15), which means:

“a facility, or any of its successors, that was not in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX.”

RECLAIM FACILITY in paragraph (b)(20), which means:

“a facility, or any of its successors, that is currently in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX.”

The following definitions were deleted from Rule 1146.1 since they were no longer referred to in this rule.

SCHOOL

Rule 1146.1 Requirements (Subdivision (c))

Prior to this amendment, RECLAIM facilities were not required to comply with the command-and-control NO_x emission limits in Rule 1146.1 because of the exemption specified in subdivision (j) of Rule 2001. In order to remove this exemption, subdivision (c) will have the following notwithstanding clause:

“Notwithstanding the exemptions contained in Rule 2001 – Applicability, Table 1 – Rules Not Applicable to RECLAIM Facilities for Requirements Pertaining to NO_x Emissions If Rule was Adopted or Amended Prior to October 5, 2018, the owner or operator of any unit(s) subject to this rule shall not operate the unit in a manner that exceeds the emission limits specified in paragraphs (c)(1), (c)(2), and (c)(3).”

RECLAIM and former RECLAIM facilities with equipment subject to Rule 1146.1 will be required to comply with the proposed NO_x emission limit specified in paragraph (c)(1) based on the applicable category in Table 1146.1-1, which represents current BARCT. The implementation schedule will be detailed in PR 1100, as specified in subparagraph (e)(1).

The NO_x emission limits are presented in Table 9 which is also in PAR 1146.1 Table 1146.1-1 – NO_x Emission Limits and Compliance Schedule. This table changed for fire-tube boilers and thermal fluid heaters. A new column for the rule reference of the different categories was added, while the column specifying dates for submittal of permit applications was removed. Additionally, PAR 1146.1 will move and specify in row (c)(1)(A) the existing NO_x limit of 30 ppm (or for natural gas fired units 0.036 lbs/106 Btu) that was specified in paragraph (c)(1) of the current Rule 1146.1.

Table 9
Table 1146.1-1 – NOx Emission Limits and Compliance Schedule

Rule Reference	Category	Limit¹	Compliance Schedule for Non-RECLAIM Facilities	Compliance Schedule for RECLAIM and Former RECLAIM Facilities
(c)(1)(A)	All Other Units	30 ppm or for natural gas fired units 0.036 lbs/10 ⁶ Btu	September 5, 2008	See Rule 1100 – Implementation Schedule for NOx Facilities
(c)(1)(B)	Any Units Fired on Landfill Gas	25 ppm	January 1, 2015	
(c)(1)(C)	Any Units Fired on Digester Gas	15 ppm	January 1, 2015	
(c)(1)(D)	Atmospheric Units	12 ppm or 0.015 lbs/10 ⁶ Btu	January 1, 2014	
(c)(1)(E)	Any Units Fired on Natural Gas, Excluding Fire-tube Boilers, Atmospheric Units, and Thermal Fluid Heaters	9 ppm or 0.011 lbs/10 ⁶ Btu	January 1, 2014 or See (c)(5)(A)	
(c)(1)(F)	Any Fire-tube Boilers Fired on Natural Gas	7 ppm or 0.0085 lbs/10 ⁶ Btu	<i>Date of amendment</i> or See (c)(5)(A)	
(c)(1)(G)	Thermal Fluid Heaters	12 ppm or 0.015 lbs/10 ⁶ Btu	<i>Date of amendment</i> or See (c)(5)(B) for units with a previous NOx limit ≤ 20 ppm prior to [<i>date of</i> <i>amendment</i>] or See (e)(2) for units with a previous NOx limit >20 ppm prior to [<i>date of</i> <i>amendment</i>]	

¹ All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.

Requirements for Low-Fuel Use Units

Paragraph (c)(4), which contains provisions for non-RECLAIM low fuel usage units that have been in operation prior to September 5, 2008, would also apply to units at a RECLAIM or former RECLAIM facility that have been in operation prior to the 12 months after the proposed amendment with an heat input less than or equal 18,000 therms per year. Pursuant to paragraph (e)(3), any owner or operator that complies with the alternative compliance option specified in paragraph (c)(4) will be subject to a NOx emission limit of 12 ppm 15 years after the date of amendment or when 50 percent or more of the unit’s burners are replaced, whichever is earlier.

On or after January 1, 2015 or until burner replacement is the compliance schedule currently specified in paragraph (e)(3) in the current Rule 1146.1 for non-RECLAIM low-fuel use units.

Since this date has passed, compliance until burner replacement will be retained, but a definite timeframe of 15 years after amendment of the rule is now included for non-RECLAIM, RECLAIM or former RECLAIM facilities.

Requirements for Units Complying with a NO_x Emission Limit of 12 ppm or less (or Thermal Fluid Heaters Complying with a NO_x Emission Limit of 20 ppm or less)

As discussed previously, PARs 1146 and 1146.1 would allow the same compliance provisions for non-RECLAIM units between 2 and 75 MMBtu/hr meeting the then-applicable BACT limit of 12 ppm as was previously done during the 2008 amendments.

Paragraph (c)(5) will specify the compliance timeframe for units currently complying with a NO_x limit of 12 ppm or less and thermal fluid heaters complying with a NO_x limit of 20 ppm or less. These units will have to meet the applicable NO_x emission limit by 15 years after the proposed amendment or when 50 percent or more of the unit's burners are replaced. The same compliance timeframe will be specified in PR 1100 for units currently complying with a NO_x limit of 12 ppm or less and thermal fluid heaters complying with a NO_x limit of 20 ppm or less at a RECLAIM or former RECLAIM facility.

- (5) *Notwithstanding paragraph (c)(1), an owner or operator that has installed, modified, or has been issued a SCAQMD Permit To Construct or Permit to Operate for the following units prior to [date of amendment], at a non-RECLAIM facility, shall meet the NO_x emission limit specified in Table 1146.1-1 by [15 years after the date of amendment] or when 50 percent or more of the unit's burners are replaced, whichever is earlier:*
- (A) *Natural gas fired units subject to subparagraph (c)(1)(E) or (c)(1)(F) complying with a previous NO_x emission limit that is less than or equal to 12 ppm; or*
- (B) *Thermal fluid heaters subject to subparagraph (c)(1)(G) complying with a previous NO_x emission limit that is less than or equal to 20 ppm*

Requirements for Biogas Units

Paragraph (c)(7), 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 each applicable compliance date for the selected unit under PR 1100 for units located at a RECLAIM or former RECLAIM facility.

Requirements for Units at Municipal Sanitation Service Facilities

As discussed above, because of the inherent challenges for units at a municipal sanitation service facility, the existing NO_x emission limits in the current Rule 1146.1 will be retained for these units. The proposed 7 ppm NO_x limit for natural gas fired fire-tube boilers or 12 ppm NO_x limit for thermal fluid heaters specified in Table 1146.1-1 will not apply to units at a municipal sanitation service facility. These units will instead continue to meet the existing NO_x limits as specified in paragraph (c)(8):

- “(8) *Notwithstanding the NO_x emission limits specified in Table 1146.1-1 of paragraph (c)(1) an owner or operator shall not operate units at a municipal sanitation service facility in a manner that discharges NO_x emissions (referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes) in excess of:*
- (A) *9 ppm for natural gas fired units; or*

- (B) 9 ppm, upon burner replacement, for natural gas fired units that were installed or modified prior to September 5, 2008 complying with a previous NOx emission limit of 12 ppm or less; or
- (C) 30 ppm for thermal fluid heaters; or
- (D) 30 ppm, upon burner replacement, for any low-fuel use unit complying with paragraph (c)(4).”

Rule 1146.1 Compliance Determination (Subdivision (d))

Subdivision (d) contains the compliance determination requirements for the equipment subject to this rule. Subparagraph (d)(6)(A) specifies the periodic monitoring for NOx emissions that each owner or operator of units subject to paragraphs (c)(1), (c)(2), or (c)(3) must conduct. For units at a RECLAIM or former RECLAIM facility, the NOx emissions checks will be required according to the monitoring schedule for the selected unit under PR 1100. Subparagraph (d)(6)(B) specifies the schedule for performing the diagnostic NOx emissions checks for low-fuel use units complying with the requirements specified in paragraph (c)(4). In the current Rule 1146.1, the schedule for performing the diagnostic emission checks for low-fuel units at a non-RECLAIM facility is on or after January 1, 2015 or during burner replacement, whichever occurs later. Since this date has passed and low-fuel units at a non-RECLAIM facility are currently complying with diagnostic NOx emissions checks according to the tune-up schedule specified in subparagraph (c)(4)(B), subparagraph (d)(6)(B) will state:

“The owner or operator of units complying with the requirements specified in paragraph (c)(4) shall check NOx emissions according to the tune-up schedule specified in subparagraph (c)(4)(B).”

For units at a RECLAIM or former RECLAIM facility the NOx emissions checks pursuant to subparagraph (d)(6)(B) will be required according to the schedule for the selected unit under PR 1100.

Rule 1146.1 Compliance Schedule (Subdivision (e))

Subdivision (e) contains the compliance schedule provisions for units at a RECLAIM or former RECLAIM facility and for thermal fluid heaters at a non-RECLAIM facility. Paragraph (e)(1) references the compliance schedule specified in PR 1100 for RECLAIM or former RECLAIM facilities, since PR 1100 will contain the implementation schedules for the units that will be transitioning out of the RECLAIM program. Paragraph (e)(2) will specify the compliance schedule for non-RECLAIM thermal fluid heaters. Permit applications will be due 12 months after rule amendment for units that are currently complying with a NOx emission limit greater than 20 ppm. These thermal fluid heaters will have to meet the proposed 12 ppm NOx limit by January 1, 2022. Paragraph (e)(3).

Rule 1146.1 Exemptions (Subdivision (f))

A new subdivision was added to include rule exemptions, which in the current rule were stated in subdivision (a). For the proposed amended rule, the exemptions will be under subdivision (f) as follows:

*“(f) Exemptions
The provisions of this rule shall not apply to:*

- (1) *any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category defined in Rule 1100 – Implementation Schedule for NOx Facilities; or*
- (2) *any unit at a municipal sanitation service facility that is subject to a NOx emission limit in a different Regulation XI rule.”*

Units that are, or will be, covered by a rule for an industry-specific category and subject to an applicable NOx emission limit are exempted from this rule. Paragraph (f)(1) includes any unit at a RECLAIM or former RECLAIM facility covered in an industry-specific category as defined in PR 1100. Currently, this includes energy generating boilers at electricity generating facilities (EGFs) and refinery boilers with applicable NOx limits specified in the corresponding rule. Paragraph (f)(2) will include units at a municipal sanitation service facility, which will have a sector specific rule specifying the applicable NOx emission limits for these units.

PROPOSED AMENDED RULE 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 MMBtu/hr. There are both manufacturer and end-user requirements contained in the rule. There were no changes to subdivision (a) Purpose and Applicability, subdivision (d) Certification, subdivision (e) Modification (Retrofit) Provisions and Demonstration of Compliance With Emission Limits subdivision (f) Identification of Compliant Units, subdivision (g) Enforcement, subdivision (i) progress reports. All other revisions to PAR 1146.2 are discussed below.

Rule 1146.2 Definitions (Subdivision (b))

The following definitions were added to Rule 1146.2.

BEST AVAILABLE RETROFIT CONTROL TECHNOLOGY in paragraph (b)(1), which means:

“as defined in the California Health and Safety Code Section 40406.”

FORMER RECLAIM FACILITY in paragraph (b)(6), which means:

“a facility, or any of its successors, that was in the Regional Clean Air Incentives Market as January 5, 2018, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program.”

RECLAIM FACILITY in paragraph (b)(15), which means:

“a facility, or any of its successors that is currently in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX.”

Rule 1146.2 Requirements (Subdivision (c))

Paragraphs (c)(3), (c)(4), and (c)(5) contain end-user requirements for the operation of units subject to the rule. As discussed in Chapter 2, staff anticipates to further assess the advancement of control technology and the cost-effectiveness of the equipment regulated under Rule 1146.2. 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 the compliance date under paragraph (c)(13) is proposed in a later timeframe (December 31, 2023) to allow staff time to conduct a technology assessment. Dependent on the results of the technology assessment, if it is determined that the NO_x emission limits specified in Rule 1146.2 still represent BARCT, NO_x RECLAIM facilities with Rule 1146.2 units will be required to meet the applicable NO_x limits by December 31, 2023. In contrast, if a more stringent BARCT level is applicable, then a new compliance schedule will be developed through a future rule development.

Rule 1146.2 Exemptions (Subdivision (h))

Subdivision (h) contains the exemptions to the provisions of this rule. Paragraph (h)(3) contains the exemptions for units at any RECLAIM or former RECLAIM facilities that are subject to a NO_x emission limit in a different rule for an industry-specific category as defined in PR 1100 – Implementation Schedule for NO_x Facilities.

PROPOSED RULE 1100

Proposed Rule 1100 - Implementation Schedule for NO_x Facilities specifies the implementation schedule for NO_x RECLAIM and former NO_x RECLAIM facilities that have equipment regulated under PARs 1146 and 1146.1. The compliance timeframe for PARs 1146 and 1146.1 was established 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. Appendix B of this staff report contains the facility and equipment analysis that were conducted to understand the number, size and emissions of the units that would be required to meet the NO_x emission limits. The implementation schedule for equipment regulated under PAR 1146.2 is included in that rule.

Rule 1100 Purpose (Subdivision (a))

The purpose of this rule is to establish the implementation schedule for Regulation XX NO_x RECLAIM facilities that are transitioning to a command-and-control regulatory structure.

Rule 1100 Applicability (Subdivision (b))

Proposed Rule 1100 applies to RECLAIM and former RECLAIM facilities that own or operate equipment that meets the applicability provisions specified in PARs 1146 and 1146.1. The applicability provisions excludes equipment at energy generating facilities (EGFs) and refineries which will be subject to a NO_x emission limit under other industry-specific rules.

Rule 1100 Definitions (Subdivision (c))

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 EGFs (except for non-power generating boilers) 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 two industry-specific categories will be addressed in individual command-and-control rules that will contain both the required emission limits and implementation schedule. Proposed Rule 1100 includes other definitions under subdivision (c) to improve the clarity of the proposed rule.

Rule 1100 Implementation Schedule (Subdivision (d))

Implementation Schedule for Retrofits

Proposed Rule 1100 subdivision (d) establishes the implementation schedule requirements for boilers and process heaters that will be subject to the emission requirements of Rule 1146 and Rule 1146.1. Proposed Rule 1100 requires owner or operators to submit a complete permit application no later than 12 months after rule adoption, which leaves about 18 – 24 months for permit approval, unit installation and source testing. RECLAIM facilities that do not meet the emission limits of Rule 1146 and Rule 1146.1 would have until 12 months after rule adoption to submit a complete permit application for retrofits or replacements. 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 cumulative total rated heat input capacity for the boilers and process heaters at the facility. The rated heat input capacity 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. Subparagraph (d)(3) will include the rule references of the

applicable NO_x concentration limits specified in subparagraphs (d)(1)(B) and (d)(1)(C). This implementation schedule will be specified in paragraph (d)(1) as follows:

- “(1) An owner or operator of a RECLAIM or former RECLAIM facility with any Rule 1146 or Rule 1146.1 unit shall:*
- (A) On or before [12 months after date of adoption], submit complete permit applications for any Rule 1146 and Rule 1146.1 units that currently do not meet the applicable NO_x concentration limit specified in subparagraph (d)(3);*
 - (B) On or before January 1, 2021 meet the applicable NO_x concentration limit for a minimum of 75% of the cumulative total rated heat input capacity for all Rule 1146 and Rule 1146.1 units at the facility; and*
 - (C) On or before January 1, 2022 meet the applicable NO_x concentration limit of 100% of Rule 1146 and Rule 1146.1 units at the facility.”*

When establishing the compliance schedule for PARs 1146 and 1146.1 for equipment at RECLAIM facilities, the compliance schedule of the 2008 amendment of Rules 1146 and 1146.1 was considered. In the 2008 amendments, there were about 2,100 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 retrofitted or replaced under the proposed amendments (126 permitted units for Rule 1146 and 19 permitted units for Rule 1146.1), therefore a similar, if not a shorter timeframe would be reasonable. The compliance timeframe for PARs 1146 and 1146.1 also took into consideration equipment size range, the number of units at a facility, and facilities with multiple units subject to multiple source-specific landing rules. The details of the analysis are provided in Appendix B of this staff report. Proposed Rule 1100 would require a compliance timeframe of 2 to 3 years. To focus on larger emission sources having an earlier final implementation date, staff proposed to stagger the implementation schedule by rated heat input, an approach that is consistent with the 2008 amendment of Rule 1146 and Rule 1146.1. About 17% of the affected facilities have multiple units with rated heat input in different size bins. Instead of setting a different compliance schedule for each size category, all Rule 1146 and 1146.1 equipment are grouped together providing more flexibility to operators to achieve the greatest emission reductions first.

Implementation Schedule for Replacement Equipment

An owner or operator that elects to fully replace the affected equipment, in lieu of installing ultra-low NO_x burners or SCRs is given until January 1, 2023 to comply with the existing NO_x emission limits in Rules 1146 and 1146.1, provided the owner or operator submits complete permit applications for any new Rule 1146 and Rule 1146.1 unit within 12 months after the date of rule adoption, as well as accepts a permit condition that identifies which unit(s) will be replaced and no longer operated once the new units are installed or after January 1, 2023, whichever is earlier. Additionally, the existing unit must be replaced on or before January 1, 2023.

Requirements for Units Complying with a NO_x limit of 12 ppm or less (or Thermal Fluid Heaters Complying with a NO_x limit of 20 ppm or less)

PARs 1146 and 1146.1 will include a provision for a compliance timeframe similar to the provision included during the 2008 amendments of Rule 1146 and 1146.1, for units that complied with the then-applicable BACT limit of 12 ppm and were installed prior to the 2008 amendments. Paragraph (d)(5) of PR 1100 will specify the compliance timeframe for units greater than 75 MMBtu/hr that are currently complying with a NO_x limit of 7 ppm or less, units between 2 and 75

MMBtu/hr that are currently complying with a NO_x limit of 12 ppm or less, and thermal fluid heaters complying with a NO_x limit of 20 ppm or less. These units will have to meet the applicable NO_x emission limit 15 years after the date of the proposed rule amendment or when 50 percent or more of the unit's burners are replaced.

Requirements for Low-Fuel Use Units

Paragraph (d)(4) contains the provision that requires the owner or operator of any low-fuel use unit at a RECLAIM or former RECLAIM facility, that in lieu of complying with the applicable emission limits specified in paragraph (d)(3) will comply with the low-fuel use provisions pursuant to paragraph (c)(5) in Rule 1146 or paragraph (c)(6) in Rule 1146.1, to retain and continue complying with the NO_x emission limits and source testing requirements specified in the SCAQMD Permit to Operate as of the date of rule adoption.

- “(4) In lieu of complying with the applicable emission limits specified in paragraph (d)(3), the owner or operator of the following unit(s) in operation prior to [12 months after date of adoption] with a heat input less than or equal to as specified below, shall retain and comply with the unit's NO_x emission limit and source testing requirements specified in the SCAQMD Permit to Operate as of [date of adoption].*
- (A) 90,000 therms per year and complying with the requirements specified in Rule 1146 paragraph (c)(5); or*
- (B) 18,000 therms per year and complying with the requirements specified in Rule 1146.1 paragraph (c)(4).”*

Exclusion for Facilities in an Industry-Specific Category

Paragraph (d)(6) states that any unit at a RECLAIM facility that is subject to an industry-specific rule as defined in subdivision (c) would not be subject to the command-and-control rules referenced in subdivision (b) or the implementation schedule listed in subdivision (d).

Rule 1100 Applicable Monitoring, Reporting, and Recordkeeping (Subdivision (e))

Monitoring, Reporting, and Recordkeeping for Title V Facilities

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 (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, PR 1100 would require Title V facilities to maintain the RECLAIM MRR requirements as part of the proposed rule amendments. In other words, Title V facilities would still be subject to the MRR requirements in RECLAIM after the transition. Staff is currently working on adopting Rule 113 – Monitoring, Reporting, and Recordkeeping (MRR) Requirements for NO_x and SO_x Sources. Once Rule 113 is adopted, all applicable PR 1100 equipment will transition to Rule 113 for MRR. In the interim, the intention of PR 1100 is for Title V RECALIM facilities to retain RECLAIM MRR. Paragraph (e)(1) states that RECLAIM or former RECLAIM facilities that are also in Title V would be required to comply with the monitoring, reporting, and recordkeeping requirements specified in Rule 2012. Additional information on MRR analysis can be found in Appendix A.

Monitoring, Reporting, and Recordkeeping for Non-Title V Facilities

Proposed Rule 1100 proposes that both major RECLAIM and non-major RECLAIM sources in non-Title V facilities to be subject to the MRR requirements in Rule 1146 series. Paragraph (e)(2)

states that the monitoring, reporting, and recordkeeping requirements in the applicable rule(s) as specified in subdivision (b) shall automatically apply for a non-Title V RECLAIM facility once it becomes a former RECLAIM facility. Additional information on MRR analysis can be found in Appendix A.

TRANSITION LOGISTICS

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 all the NO_x emitting equipment located at the RECLAIM facility is subject to a non-RECLAIM rule that regulates NO_x emissions and does not specify an exemption for RECLAIM facility emissions. Command-and-control rules that exempt RECLAIM facilities will undergo amendments throughout the transition process to include RECLAIM facilities. Once the applicable rules at a RECLAIM facility have been adopted and/or amended a facility would be eligible exit.

The procedure for the transition can be found in Rules 2001 and 2002. Rule 2001 specifies the eligibility criteria for a facility to exit RECLAIM. 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.

Rule 2001 Paragraph (g)(2) would specify actions for submitting the request to opt-out of the NO_x RECLAIM program:

“The owner or operator of a RECLAIM facility that is eligible to exit the NO_x RECLAIM program, pursuant to the requirements of paragraph (g)(1), may notify the Executive Officer with a request to opt-out that includes the identification of:

(A) All permitted and unpermitted NO_x RECLAIM emission equipment, including applicable control equipment; and

(B) Permitted NO_x emission levels, and if not available, manufacturer guaranteed NO_x emission levels.”

Upon review of the submitted information, the Executive Officer would notify the facility that the facility meets the criteria to transition out of RECLAIM and would issue an initial determination notification to initiate the facility’s transition to command-and control. A facility would then be subject to the provisions in PAR 2002 (f)(6) through (f)(10), but not be required to resubmit any equipment information required by subparagraphs (f)(6)(A) and (f)(6)(B) because the Executive Officer would have already obtained the facility’s equipment information through the opt-out process prior to issuing the initial determination notification. If the Executive Officer denies the request to transition out of NO_x RECLAIM, however, the facility would remain in the RECLAIM program. The reasons for a denial would be that the facility does not meet all the requirements in proposed paragraph (g)(1). If an applicable non-RECLAIM rule has not yet been amended, the facility would not be allowed to exit. Also, if it is determined that a piece of equipment that emits non-combustion NO_x and has no applicable rule for its NO_x emissions, the facility would not be allowed to exit. The facility would be notified if the request to opt-out is denied. These approval and denial provisions are contained in subparagraph (g)(3), which states:

If the owner or operator of a RECLAIM facility meets the criteria for exiting the NO_x RECLAIM program, specified in paragraph (g)(1) and has satisfied the requirements of paragraph (g)(2), the Executive Officer will issue an initial determination notification and the facility shall be subject to the provisions of Rule 2002, paragraphs (f)(6) through (f)(10), excluding the requirements in subparagraphs (f)(6)(A) and (f)(6)(B). If the request to opt-out is denied, the facility shall remain in RECLAIM, and the owner or operator will be notified.

Rule 2002 Paragraph (f)(10) outlines requirements pertaining to RTCs for facilities that are notified for exiting RECLAIM. It states that:

“The owner or operator of any RECLAIM facility that receives a final determination notification from the Executive Officer pursuant to paragraph (f)(8):

(A) 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 that current compliance year’s RTCs until the facility is transitioned out of the RECLAIM program; and

(B) Shall provide Emission Reduction Credits to offset any emissions increases, calculated pursuant to Rule 1306 – Emission Calculations, notwithstanding the exemptions contained in Rule 1304 – Exemptions, until New Source Review provisions governing emission calculations and offsets for former RECLAIM sources are amended after (date of amendment).”

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. Additionally, any RECLAIM facility that exits the NO_x RECLAIM program will not have access to the SCAQMD internal offset bank until new provision governing emission calculations and offset requirements for former RECLAIM facilities are adopted in Regulation XIII. This temporary provision would require all former RECLAIM facilities to provide emission reduction credits (ERCs) to offset any emission increases for new or modified sources even if the facility has a PTE of less than 4 tons per year and would have been eligible for emission offsets from the SCAQMD internal bank if the source was not RECLAIM.

Currently, facilities regulated under the command-and-control regulatory structure are subject to Regulation XIII for New Source Review (NSR) requirements. There are a number of NSR policy issues that need to be resolved as facilities transition to a command-and-control regulatory structure. Staff has been working on these issues with the RECLAIM Working Group. In addition, staff will continue discussions with EPA on NSR issues. One of the most important NSR issues is the future availability of NO_x ERCs in the open market and the concern that there is not a sufficient supply of ERCs in the open market for facilities that want to install new or modified equipment that triggers NSR. RECLAIM facilities that are comprised of the region’s largest emitters would join an existing open market with a limited amount of ERCs. Until the NSR concerns are resolved, facilities will be allowed to remain in RECLAIM for a limited time upon receiving an initial determination notification. However, facilities would still be subject to non-RECLAIM rules and their associated BARCT implementation schedules that been adopted or amended to include RECLAIM facilities. Rule 2002 paragraph (f)(11) allows facilities to request to remain in RECLAIM:

“An owner of operator of a RECLAIM facility that receives an initial determination notification may elect for the facility to remain in RECLAIM if a request to the Executive Officer to remain in RECLAIM is submitted, including any equipment information required pursuant to paragraph (f)(6).

(A) Upon written approval by the Executive Officer that the facility shall remain in RECLAIM:

(i) The facility may remain in RECLAIM until a subsequent notification is issued to the facility that it must exit by a date no later than December 31, 2023.

(ii) The facility is required to submit any updated information within 30 days of the date of the subsequent notification.

(iii) The facility shall comply with all requirements of any non-RECLAIM rule that does not exempt NOx emissions from RECLAIM facilities.”

As a result of the proposed amendments to Rules 1146, 1146.1 and 1146.2, staff has identified 22 RECLAIM facilities that could potentially be transitioned out of 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. After PARs 1146, 1146.1, and 1146.2 are amended to remove the exemption for RECLAIM facilities, the identified facilities will be ready to transition from the cap-and-trade regulatory approach to a command-and-control regime.

CHAPTER 4: IMPACT ASSESSMENT

INTRODUCTION

EMISSION REDUCTIONS

SOCIOECONOMIC ASSESSMENT

CALIFORNIA ENVIRONMENTAL QUALITY ACT

**DRAFT FINDINGS UNDER CALIFORNIA HEALTH AND SAFETY CODE
SECTION 40727**

COMPARATIVE ANALYSIS

INTRODUCTION

Among the 103 RECLAIM facilities that will be affected by the proposed amendments, 18 facilities already met BARCT requirements and will only be subject to change to monitoring recordkeeping and reporting. A total of 65 facilities would be required to retrofit the non-compliant units by the compliance dates specified in PR 1100, while 20 facilities operating units that comply with the applicable RECLAIM BARCT limit of 12 ppm would not apply until the unit's burner replacement. The proposed rule amendments are estimated to reduce 0.27 tons per day (tpd) of NO_x from RECLAIM facilities by January 1, 2023. The proposed amendments affect a wide variety of RECLAIM and non-RECLAIM facilities. Staff has estimated that there are about 291 active permitted units in the RECLAIM universe that are affected by this rule amendment (220, 39 and 32 permitted units affected by PAR 1146, 1146.1 and 1146.2 respectively). Among the 291 units impacted, 148 units would be required to comply with the existing BARCT limits in Rule 1146 series (126 permitted units for Rule 1146, 19 permitted units for Rule 1146.1, and 3 permitted units for Rule 1146.2) by the compliance dates as specified in PR 1100, 142 units would be allowed to meet the emission limits upon burner replacement, and units that are already at BARCT would be subject to the change in MRR requirements upon transition.

EMISSION REDUCTIONS

The total NO_x inventory for the RECLAIM units affected by PARs 1146 series is estimated to be 0.42 tons per day. This estimate is taken from SCAQMD annual emission report (AER) inventory database for compliance year 2016 for permitted units, and excludes EGFs and refineries. The District's AER program was developed to track emissions of air contaminants from permitted facilities. Facilities with annual emissions exceeding 4 or more tons of nitrogen oxides (NO_x), sulfur oxides (SO_x), volatile organic compounds (VOCs), specific organics (SPOG), particulate matter (PM), or emissions of 100 tons per year or more of carbon monoxide (CO) are required by the District to submit an annual emissions report. Facilities could also be required to submit AER if the facility receives a notification from SCAQMD or subject to the AB2588 Program for reporting quadrennial updates to its toxics inventory. For each piece of RECLAIM equipment, the annual activity is estimated using the facilities fuel usage as reported in the AER reports for year 2016. Emission factor is represented by the permit limit specific for each unit. Emissions for RECLAIM units identified as major sources, as defined in SCAQMD Rule 2012, are constantly monitored with CEMS, so the units may not be assigned a permit limit for emissions reporting. Emission factors for RECLAIM major sources can be back-calculated using CEMS reporting data and reported fuel for the corresponding year. Annual emissions for major sources were calculated from facility submitted AER usage and emission factor derived from CEMS back-calculations or permit limit. For units with missing data or reports, their emissions were calculated assuming 50% operating capacity. The NO_x emission distribution by the size range are as follows:

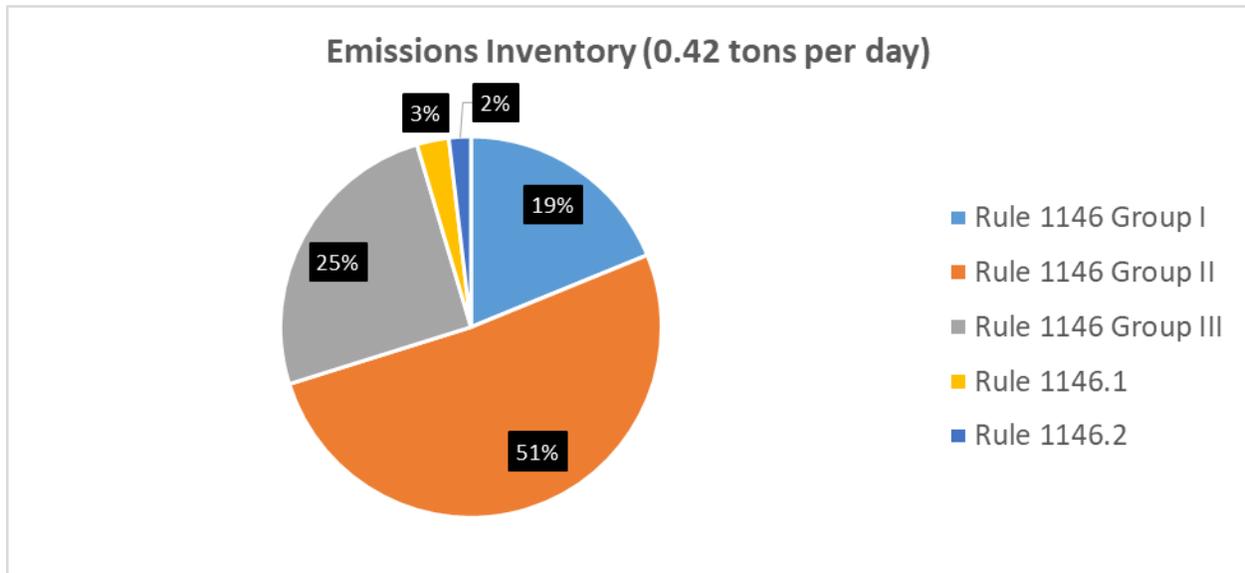


Figure 10
2016 RECLAIM Baseline Emissions by Size Range

As presented in Figure 10, about half of the 2016 baseline emissions were emitted from Rule 1146 Group II units (20 to <75 MMBtu/hr). On average, each Group II unit accounted for 0.0027 tpd of NO_x emissions. Although Group I units contributed to 19% of baseline emissions, on average, each Rule 1146 Group I unit accounted for more than quadruple the amount of emissions (0.011 tpd) than a Group II unit (0.0027 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 NO_x emission limits for the various categories of boilers and heaters presented in the staff proposal. Based on this methodology, the proposed rule amendments are estimated to reduce approximately 0.27 tons per day of NO_x emissions from RECLAIM facilities regulated under PARs 1146 series. The estimated emission reductions by unit size range are presented in Figure 11.

Note that the emissions for Rule 1146.2 were calculated based on the 32 permitted units. As discussed in Appendix B, the majority of Rule 1146.2 units are exempt from permitting. Therefore, the actual emission inventory, and the associated emission reductions of PAR 1146.2 could be considerably higher than the ones presented in Figures 10 and 11. To avoid overestimating the emission reductions from PAR 1146.2, only emissions from the permitted units were included in the analysis.

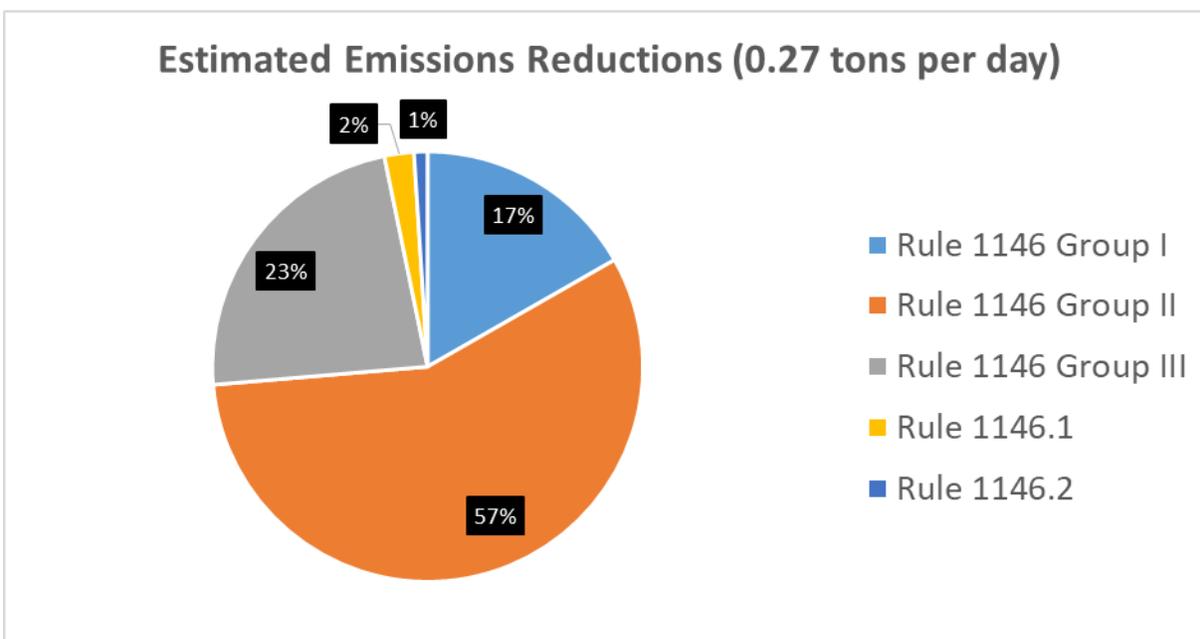


Figure 11
RECLAIM Emission Reduction by Size Range

Total emissions inventory for non-RECLAIM units affected by PAR 1146 series is estimated to be about 0.66 tpd. Estimates for baseline emissions and emission reductions of units within the non-RECLAIM universe are calculated using unit distribution figures from 2008 amendments of Rule 1146 and Rule 1146.1, thermal fluid heaters are not included in the calculation estimates.

Baseline emissions for non-RECLAIM units in Rule 1146 Group I, Rule 1146 Group II, Rule 1146 Group III, and Rule 1146.1 were calculated with assumptions that unit composition of the universe is the same as that at the time of the 2008 evaluation and approximately of 80% of units evaluated in 2008 are still in operation. Calculations for emission reductions also assumed that the fraction of fire-tube units in non-RECLAIM universe is the same as those in the RECLAIM universe, where 40% of Rule 1146 Group II, Rule 1146 Group III and Rule 1146.1 units were fire-tube units that will be subject to proposed limits of 7 ppm. Total emissions baseline calculated from units in Rule 1146 Group I, Rule 1146 Group II, Rule 1146 Group III, and Rule 1146.1 totaled around 0.48 tpd and total reductions were calculated to be about 0.05 tpd. Emission reductions for non-RECLAIM natural gas fired units are effective 15 years after date of rule amendment. Thermal fluid heaters were not included in this calculation due to the lack of distinction in their permits that set them apart from other process heaters. Thermal fluid heaters make up for a very small portion of the RECLAIM universe (<4%) and the emission reductions are assumed to be nominal in the non-RECLAIM universe.

SOCIOECONOMIC ASSESSMENT

A Draft Socioeconomic Impact 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 December 7, 2018.

CALIFORNIA ENVIRONMENTAL QUALITY ACT ANALYSIS

PARs 1146 series 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 the CEQA and SCAQMD’s Certified Regulatory Program (Rule 110), the SCAQMD, as lead agency for the proposed project, prepared a Draft Subsequent Environmental Assessment (SEA) for PARs 1146 series and PR 1100 which was released for a 45-day public review and comment period from April 3, 2018 to May 18, 2018 and four comment letters were received. Subsequent to the release of the Draft SEA for public review, changes were made to the project description and the environmental analysis. For this reason, the SCAQMD revised and recirculated a Revised Draft SEA for an additional 45-day public review and comment period from September 27, 2018 to November 13, 2018. As with the Draft SEA, the analysis in the Revised Draft SEA also indicated that while reducing NOx emissions is an environmental benefit, secondary significant adverse environmental impacts are also expected for the topic area of hazards and hazardous materials. Since significant adverse impacts were identified, an alternatives analysis and mitigation measures are required and are included in the Revised Draft SEA. [CEQA Guidelines Section 15252].

The proposed project may have statewide, regional, or area-wide significance; therefore, a CEQA scoping meeting was required (pursuant to Public Resources Code section 21083.9(a)(2)) and held at the SCAQMD’s Headquarters in conjunction with a prior Public Workshop on February 14, 2018. The comment made at the CEQA scoping meeting and the response to the comment is included in Appendix F of the Revised Draft SEA. The comment letters received relative to the Draft SEA and the responses to the comments are included in Appendix G of the Revised Draft SEA. In addition, all comments received during the public comment period on the analysis presented in the Revised Draft SEA will be responded to and included in an appendix to the Final SEA.

Prior to making a decision on the adoption of the proposed project, the SCAQMD Governing Board must review and certify the Final SEA, including responses to comments, as providing adequate information on the potential adverse environmental impacts that may occur as a result of adopting the proposed project.

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 their meaning can be easily understood by the persons directly affected by them.

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 rules are 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.

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 10 below.

**Table 10
Comparative Analysis**

Rule Element	PAR 1146	PAR 1146.1	PAR 1146.2	PR 1100	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	RECLAIM or post-RECLAIM facilities	Facilities regulated under the NOx RECLAIM program (SCAQMD Reg. XX)	None
Requirements*	<p>NOx limits:</p> <ul style="list-style-type: none"> • Digester gas: 15 ppmv • Landfill gas: 25 ppmv • Natural gas: 5 ppmv for ≥ 75 MMBtu/hr, 7 or 9 ppmv for 20–75 MMBtu/hr, 12 ppm for atmospheric, and 12 ppm for thermal fluid heaters <p>For other types of fuels:</p> <ul style="list-style-type: none"> • 30 ppmv for other gaseous fuels; 40 ppmv for nongaseous fuels • CO limit: 400 ppmv <p>*All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.</p>	<ul style="list-style-type: none"> • Digester gas: 15 ppmv • Landfill gas: 25 ppmv • Natural gas: 7 or 9 ppmv, 12 ppm for atmospheric, and 12 ppm for thermal fluid heaters • All others: 30 ppmv • CO limit: 400 ppmv. 	<p>NOx limit is 20 ppmv for new units less than 2 MMBtu/hr.</p> <p>NOx limit is 30 ppmv for retrofit units less than 2 MMBtu/hr.</p>	<ul style="list-style-type: none"> • Schedule for meeting BARCT emission limits and MRR requirements 	<p>For refinery gas: 2 ppmv for units > 40 MMBtu/hr</p> <p>For other units: 9 ppmv for units > 20 MMBtu/hr; and 12 ppmv for units ≥ 2 MMBtu/hr</p>	None
Reporting	Every 6 months for units greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200×10^9 Btu per year (Rule 218)	None	None	As specified in SCAQMD Rules 1146, 1146.1 and 1146.2	<ul style="list-style-type: 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	<ul style="list-style-type: none"> • A continuous in-stack NOx monitor for units greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200×10^9 Btu per year • Source testing once every 3 – 5 years for other units 	<ul style="list-style-type: none"> • Source testing once every 5 years 	None	As specified in SCAQMD Rules 1146, 1146.1 and 1146.2	<ul style="list-style-type: 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	<ul style="list-style-type: none"> • Source test records • Maintenance & emission records = 2 years • Monitoring data = 2 years (5 years if Title V) 	<ul style="list-style-type: none"> • Source test records = 2 years (5 years if Title V) • Monitoring data = 2 years (5 years if Title V) 	None	As specified in SCAQMD Rules 1146, 1146.1 and 1146.2	<ul style="list-style-type: 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

APPENDIX A – ANALYSIS OF MRR REQUIREMENTS

INTRODUCTION

Under RECLAIM 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. Rules 1146 and 1146.1 also requires periodic emissions monitoring for facilities to demonstrate compliance to emission concentration limits. 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 checks, (c) reporting, (d), recordkeeping, and (e) missing data procedures are presented in Tables A1-5, respectively.

**Table A-1
Source Testing Requirements**

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	Rule 1146 Series		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr and • >200 Billion Btu/year	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 ⁺ ; 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

[^] Unless equipment is reported to be using an alternate emission factor

⁺ Except units equipped with CEMS

**Table A-2
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 and • >200 Billion Btu/year	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	Semi-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 A-3
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 and • >200 Billion Btu/year	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	Report and Annual Permit Emissions Program	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 A-4
Recordkeeping Requirements**

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	Rule 1146 Series		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr and • >200 Billion Btu/year	• < 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 A-5
Missing Data Procedures**

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	Rule 1146 Series		
Major Source* <ul style="list-style-type: none"> • ≥ 40 MMBtu/hr or • > 10 tpy 	R1146 <ul style="list-style-type: none"> • ≥ 40 MMBtu/hr and • > 200 Billion Btu/year 	For $> 95\%$ availability (short gaps) <ul style="list-style-type: none"> • use avg. valid hour before and after or use highest hourly NOx conc. for last 30 days For $< 95\%$ availability (longer gaps) <ul style="list-style-type: none"> • use highest hourly NOx conc. or last 30 days, or 365 days For $< 90\%$ availability <ul style="list-style-type: none"> • use lifetime highest hourly NOx conc. 	Not applicable
Large Source* <ul style="list-style-type: none"> • ≥ 10 and < 40 MMBtu/hr or • > 4 and < 10 tpy 	R1146 <ul style="list-style-type: none"> • ≥ 5 and < 40 MMBtu/hr 	If missing data is < 1 month <ul style="list-style-type: none"> • use average monthly for the previous 12 months. If missing data is > 1 month <ul style="list-style-type: none"> • use highest monthly fuel usage for the previous 12 months. If missing data is > 2 months or no records are available <ul style="list-style-type: none"> • assume 24 hours operation at maximum rated capacity at an uncontrolled emission factor 	Not applicable
Process Unit* <ul style="list-style-type: none"> • > 2 and < 10 MMBtu/hr • ≤ 2 MMBtu/hr if permitted 	R1146.1 <ul style="list-style-type: none"> • > 2 and < 5 MMBtu/hr 	If missing data is < 1 quarter <ul style="list-style-type: none"> • use average quarterly fuel usage for the previous 4 quarters. If missing data is > 1 quarter <ul style="list-style-type: none"> • use source's highest quarterly fuel usage for the previous 4 quarters. 	Not applicable
R219 Exempt <ul style="list-style-type: none"> • ≤ 2 MMBtu/hr 	R1146.2 <ul style="list-style-type: none"> • ≤ 2 MMBtu/hr 	If no records are available <ul style="list-style-type: none"> • assume 24 hours operation at maximum rated capacity at an uncontrolled emission factor 	

APPENDIX B – FACILITY AND EQUIPMENT ANALYSIS

INTRODUCTION

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 the following pathways to transition facilities out of RECLAIM:

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

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

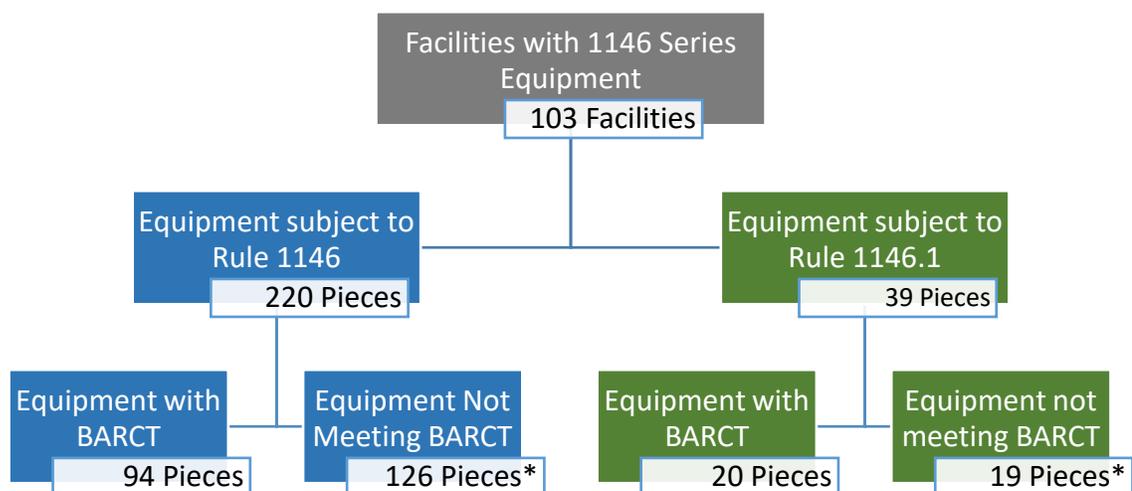
- Electricity Generating Facilities (EGFs)
- Refineries
- Metal Operations Facilities
- Aggregate Facilities

However the list of industry specific categories may change as the RECLAIM transition rulemaking process continues. The facilities in the 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). Energy generating equipment located in EGFs and equipment located in refineries are subject to requirements to be established in the industry-specific rules. Since they would not follow the implementation schedule established for PARs 1146 series, they are not included in the permit analysis presented in this staff report. However, for metal operations and aggregate facilities as well as EGF equipment that do not generate electricity, their Rule 1146 series equipment will be subject to the requirements and implementation schedule as specified in the proposed rule amendments.

To understand the number and the size of units that need to meet the NO_x concentration limits, permit data was retrieved in August 2017 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.

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

Out of the 259 RECLAIM facilities, 103 facilities were permitted with equipment that will be subject to PARs 1146, 1146.1 or 1146.2. As shown in Figure B-1, for the 103 facilities, there are 220 pieces of equipment that are subject to Rule 1146 and 39 pieces of equipment that are subject to Rule 1146.1. Of the 220 pieces of Rule 1146 equipment, 126 are currently not meeting the proposed BARCT limits. Of the 39 Rule 1146.1 equipment, 19 are currently not meeting the BARCT limit. Some facilities will have a combination of Rule 1146 and 1146.1 pieces of equipment at their facility.



**Includes units not subject to BARCT until burner replacement*

Figure B-1
RECLAIM Facilities with Rule 1146 Series Equipment

Figure B-2 shows the number of units that are currently not meeting the applicable NOx concentration limits in Rules 1146 and 1146.1 at a facility level. Equipment currently in compliance with RECLAIM BARCT of 12 ppm are considered in compliance until burner replacement. Most of the facilities had 1 to 3 pieces of equipment that are non-compliant with Rule 1146 & Rule 1146.1 limits. Nine facilities had between 4 and 7 non-compliant units, while 2 facilities had 8 or more pieces of non-compliant equipment. One of two facilities had 19 units between 5 and 20 MMBtu/hr not meeting the Rule 1146 BARCT limit of 7 ppm. However, 13 of the 19 units are currently meeting the RECLAIM BARCT limit of 12 ppm, and would not need to meet the lower NOx emission limit under Proposed Amended Rules 1146 and 1146.1 until the unit's burner replacement or 15 years after rule adoption, whichever occurs earlier. The other facility had a total of 11 non-compliant units (3 Rule 1146 units and 7 Rule 1146.1 units), of which 3 would not need to meet the lower NOx emission limit under Proposed Amended Rules 1146 and 1146.1 until the unit's burner replacement or 15 years after rule adoption, whichever occurs earlier. Excluding the units that could delay compliance until burner replacement, these two facilities are required to retrofit 6 and 8 units, respectively. These units range from 2 to 13 MMBtu/hr, and compliance can be achieved with ultra-low NOx burners.

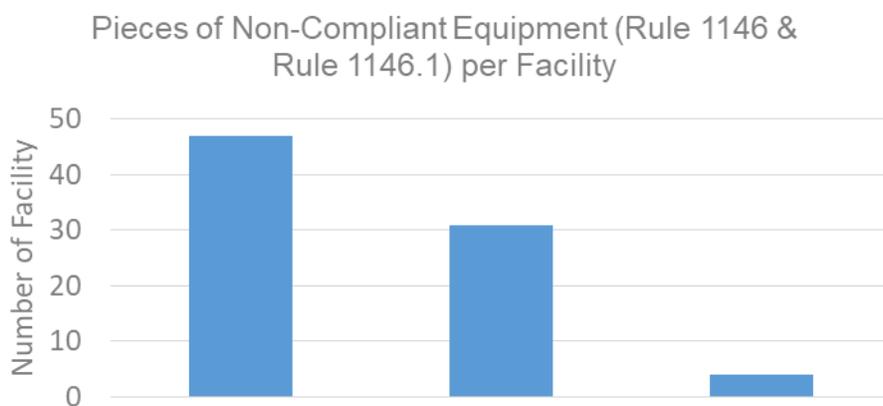


Figure B-2
Non-Compliant Equipment in Facilities Subject to Rules 1146 & 1146.1 Only

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 B-3, about half of the facilities had 3 or less non-Rule 1146 and 1146.1 units¹² (“other units”). Most of these equipment are subject to Rule 1110.2 (*Emissions from Gaseous - and Liquid-Fueled Engines*) or Rule 1147 (*NOx Reductions from Miscellaneous Sources*), which are scheduled to be amended in fall 2018 and in 2019 respectively. Twenty-five facilities had 4 to 10 other units. On this basis, facilities with 10 or less other units can meet the NOx concentration limits for Rule 1146 and/or Rule 1146.1 within three years.

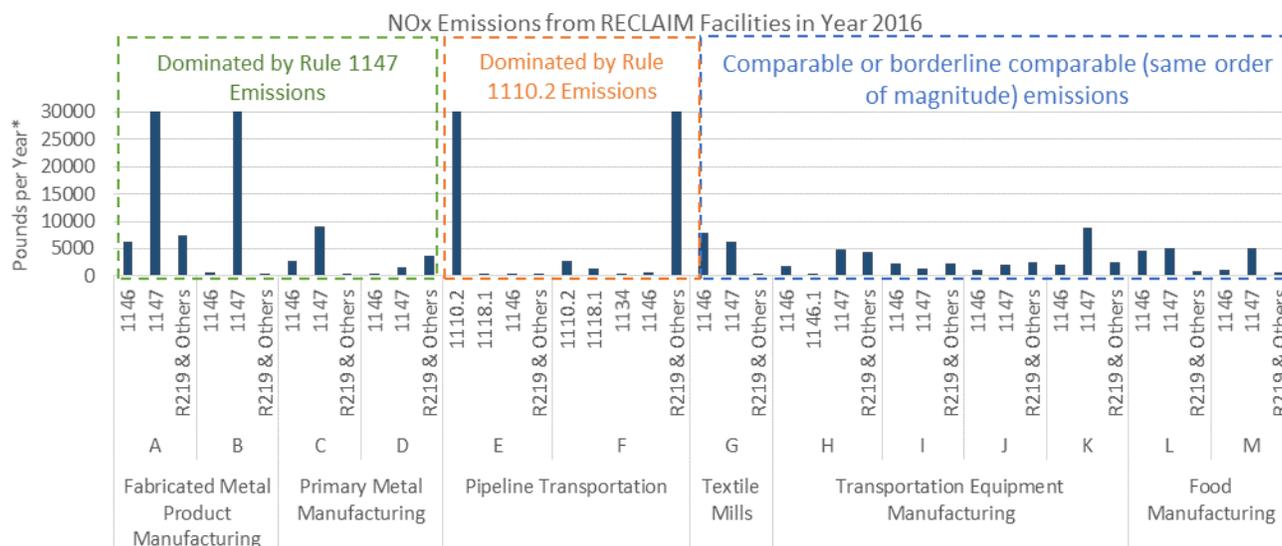


Figure B-3
Non-Rule 1146 and Rule 1146.1 Equipment

To ensure that the greatest emissions reductions are achieved as early as practicable, staff evaluated the NOx emissions for each source category for facilities with more than 10 other units. Figure B(4) illustrates the NOx emissions of the 13 facilities with more than 10 units subject to other

¹² Excludes Rule 1470 equipment

landing rules. Four of the 13 facilities (Facilities A-D) had emissions dominated by Rule 1147 (*NOx Reductions from Miscellaneous Sources*) units. These facilities are associated with fabricated metal product manufacturing and primary metal manufacturing. Emissions from the two facilities (Facility E and Facility F) in the pipeline transportation industry were largely contributed by their internal combustion engines that are subject to Rule 1110.2 (*Emissions from Gaseous - and Liquid-Fueled Engines*). For the remaining facilities, emissions from their Rule 1146 series are mostly comparable with the emissions from other landing rules.



* Emissions from some facilities exceeded 30,000 pounds per year.

Figure B-4
Emissions from Facilities with More than 10 Units
Subject to Other Landing Rules

For facilities with emissions dominated by other landing rules, staff evaluated each facility individually to better understand the emissions from different source types. The permitted units that are subject to the proposed rule amendments in Facility D and Facility E are already at BARCT, and they are not impacted by the compliance schedule in the proposed amendments. For Facilities A, B, C, and F, they have 5, 1, 2, and 3 permitted units that would be required to retrofit according to the compliance timeframe set forth in the proposed amendments.

These units ranged from 3 to 33 MMBtu/hr. For Rule 1146.1 and Rule 1146 Group III units not in compliance with RECLAIM BARCT of 12 ppm, will need to meet proposed limits of 7 ppm, compliance can be achieved with ultra-low NOx burners while units that meet RECLAIM BARCT would not need to meet the lower NOx emission limit under Proposed Amended Rules 1146 and 1146.1 until the unit’s burner replacement or 15 years after rule adoption, whichever occurs earlier. Rule 1146 Group II units that are not in compliance with the RECLAIM BARCT will need to meet proposed limit of 5 ppm while Group II units currently in compliance with RECLAIM BARCT will need to meet proposed limit of 7 ppm at burner replacement. Rule 1146 Group II units that do not meet RECLAIM BARCT would require the more expensive control technology of SCR. In particular, the units in Facilities A-C are subject to Rule 1147, which is scheduled to be amended in 2019 as presented in various monthly RECLAIM Working Group Meetings. Given the time required for facilities to perform the engineering evaluation as well as the time needed for permit

application and processing, it is very likely that the implementation timeframe for the proposed amendments to Rule 1147 series would be later than January 1, 2021, leaving time for compliance with the Rule 1146 series equipment before that timeframe. Staff also determined that there are many other facilities belonging to different industries that are in a similar situation as some of these metal and aggregate facilities (e.g., many Rule 1147 pieces of equipment, along with Rule 1146 series equipment), and they would be subject to PARs 1146 series under the proposed amendments.

Analysis of Rule 1146.2 Units

Rule 1146.2 applies to boilers and process heaters with a rated heat input less than or equal to 2 MMBtu/hr. However, Rule 1146.2 units are exempt from SCAQMD permitting requirements per Rule 219 (Equipment Not Requiring a Written Permit Pursuant to Regulation II). Only a small portion of the Rule 1146.2 units are permitted due to unique circumstances, such as operators obtaining a lower emission factor for calculating the unit's potential to emit (PTE). As of September 2018, there is a total of 32 permitted Rule 1146.2 units in the RECLAIM universe, with 28 units meeting the existing Rule 1146.2 NO_x concentration limit of 30 ppm. Among the 28 units, 21 of them were permitted at 12 ppm, above and beyond the 30 ppm requirement. Four of the 32 permitted Rule 1146.2 RECLAIM units were permitted at emission limits above the Rule 1146.2 limit, and would require retrofit / replacement to meet the existing Rule 1146.2 requirements. It is important to emphasize that majority of the Rule 1146.2 units in RECLAIM facilities are not permitted. Although non-RECLAIM facilities are required to register Rule 1146.2 equipment from 1 up to and including 2 MMBtu/hr under Rule 222 (*Filing Requirements For Specific Emission Sources Not Requiring a Written Permit Pursuant to Regulation II*), RECLAIM facilities are exempt from the registration requirements. In addition, RECLAIM facilities report emissions from Rule 1146.2 units in the aggregate with other Rule 219 exempt equipment. Thus, the actual number of Rule 1146.2 units in the RECLAIM universe and its associated emissions could not be accurately quantified as part of this rule development, and the analysis below is the best estimate based on the best available information to date.

To better estimate the number of Rule 1146.2 units in RECLAIM, staff evaluated the equipment inventory provided by the facility responses from the initial determination notifications. This initial notification included an existing list of NO_x 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 NO_x emitting equipment that is not subject to permitting requirements (e.g., Rule 1146.2 units). As of April 2018, 37 RECLAIM facilities responded to the initial determination notifications, and a total of 118 Rule 1146.2 Type 2 units were reported. Based on the results of this initial survey, on average, each RECLAIM facility has 3.19 pieces of Rule 1146.2 Type 2 equipment. Assuming the same ratio for the rest of the RECLAIM facilities, it is estimated that about 850 Rule 1146.2 Type 2 units are present in the RECLAIM universe comprising of 259 facilities. While this provides an adequate estimation of the number of Rule 1146.2 units under the RECLAIM program, staff commits to collect and improve the RECLAIM inventory for this source category through annual inspections.

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. Equipment subject to PAR 1146 series and near final emission limits (RECLAIM BARCT) will not need to comply with lower emission limits under burner replacement or 15 years

after rule amendment. The distribution of units affected by PARs 1146 and 1146.1 by size range is presented in Table B-1.

Table B-1
Number of Equipment by Size

Rule Applicability	Meet RECLAIM BARCT	Do Not Meet RECLAIM BARCT
Rule 1146		
Group I (≥ 75 MMBtu/hr)	4	3
Group II (20 to <75 MMBtu/hr)	26	52
Group III (5 to < 20 MMBtu/hr)	55	69
Rule 1146 Thermal Fluid Heaters	9	2
Rule 1146.1 (2 to <5 MMBtu/hr)	20	19
Total	114	145

APPENDIX C – PUBLIC COMMENTS

Thu 2/22/2018 9:19 AM

 Jiang, Hao <Hao.Jiang@disney.com>
RE: PAR 1146s and PR1100

To Kalam Cheung; Kevin Orellana; Gary Quinn; Tracy Goss

 This message is part of a tracked conversation. Click here to find all related messages or to open the original flagged message.

From: Jiang, Hao [<mailto:Hao.Jiang@disney.com>]
Sent: Friday, February 16, 2018 2:15 PM
To: Kevin Orellana <korellana@aqmd.gov>; Kalam Cheung <kcheung@aqmd.gov>; Gary Quinn <GQuinn@aqmd.gov>; Tracy Goss <TGoss@aqmd.gov>
Subject: PAR 1146s and PR1100

Kevin and all,

Disneyland would like to submit 2 comments to the PR1100.

- (1) PR1100 should include a provision stating that RECALIM units receive deferred compliance deadline to next burner replacement per Rule 1146(c)(7) or Rule 1146.1 (c)(6) shall not subject to the January 1, 2020 and January 1, 2023 compliance deadlines.
This was brought to the February 14 public meeting and was confirmed by the District staff.
- (2) PR1100 should include a provision stating that RECALIM units receive deferred compliance deadline to next burner replacement per Rule 1146(c)(7) or Rule 1146.1 (c)(6) shall be counted as BARCT-compliant equipment in determining heat input percentage for implementation schedule. This is due to the same reason that businesses should not be penalized for install BACT earlier than required.

Thank you.

Hao Jiang, P.E.
Environmental Affairs
Disneyland Resort
PO Box 3232
TDA 224C
Anaheim, Ca 92802
714-781-4504, hao.jiang@disney.com

Handwritten annotations: A vertical scroll bar is on the right side of the email content. Two red brackets are drawn to the right of the scroll bar. The first bracket spans the first list item and is labeled "1-1". The second bracket spans the second list item and is labeled "1-2".

Response to Comment 1-1

Rule 1100 (d)(5) proposes to allow a RECLAIM or former RECLAIM facility that installed, or modified, or has been issued a SCAQMD Permit to Construct or Permit to Operate, a respective Rule 1146 or Rule 1146.1 natural gas fired unit prior to the date of rule adoption and near final emission limit to comply with proposed rule limits at the time of the unit's burner(s) replacement or 15 years after rule adoption.

Response to Comment 1-2

Units near final emission limit will be counted towards the 75% total heat input compliance requirement.

Thu 2/22/2018 9:19 AM

 Jiang, Hao <Hao.Jiang@disney.com>
RE: PAR 1146s and PR1100

To: Kalam Cheung; Kevin Orellana; Gary Quinn; Tracy Goss

 This message is part of a tracked conversation. [Click here to find all related messages or to open the original flagged message.](#)

Morning Kalam,

Thank you for checking status of our 13 boilers for me. I have 2 more comments/questions regarding PR1100.

- (1) PR1100 should make it clear that deferred compliance deadline to next burner replacement per Rule 1146(c)(7) or Rule 1146.1 (c)(6) shall be required only after facility exits RECALIM regulation.
This is to eliminate the confusion that burner replacement while remain in the RECLAIM is not subject to 9 ppm standard.
- (2) I like to learn that how R1146 and R1146.1 facilities handle the permitting process for burner replacement. Boiler OEMs do not have a fixed schedule for burner replacement so facilities normally practice "run-to-fail". Because the District needs 6-9 months (for Title V facility) to complete a permit revision, facilities would have to either plan ahead to replace burner that is still working to avoid permitting delay, or to bring in rental units to cover the permitting period. Both create significant financial burdens and operation disturbances to a facility. Can District create a provision in PR1100 that allows facilities to replace to 9ppm burner before obtaining permit revision, provided that a permit application is submitted within 2 weeks of such replacement?
This is because there are only 42 of such units and new burners reduce emissions (12ppm to 9ppm).

Thank you
Hao

} 2-1
} 2-2

Response to Comment 2-1

As part of this rule amendment, PARs 1146 series will expand the applicability to include units that were not previously required to comply with Rules 1146 and 1146.1 because they were in the NO_x RECLAIM program. Rule 1100 (c)(5) proposes to allow a RECLAIM or former RECLAIM facility that installed, or modified, or has been issued a SCAQMD Permit to Construct or Permit to Operate, a respective Rule 1146 natural gas fired unit or Rule 1146.1 natural gas fired unit prior to the date of rule adoption and near final emission limit to comply with proposed rule limits at the time of the unit's burner(s) replacement or 15 years after rule adoption.

Response to Comment 2-2

Before a burner becomes inoperable, the burner or boiler performance will suffer and show signs of wear and tear, which would be shown in the various operating parameters. For example, a review of higher fuel usage or even a Visible Emission Evaluation (VEE) at the smoke stack could indicate a problem with the burner assembly. Once a determination that the boiler is suffering a performance problem, an overall evaluation of the boiler should take place. Overall, if there are signs of a potential problem, routine maintenance should be able to ascertain the problem well ahead of time for planning purposes.



Daniel McGivney
 Environmental Affairs
 Program Manager

Tel: 951-225-2958
 dmcgivney@semprautilities.com

February 28, 2018

Mr. Philip Fine, Ph.D.
 Deputy Executive Officer
 South Coast Air Quality
 Management District
 21865 Copley Drive
 Diamond Bar, CA 91765

via email

**Subject: Proposed Amended Rules 1146, 1146.1, 1146.2, and Proposed Rule 1100
 Transition Rules for RECLAIM Facilities**

Dr. Fine:

Southern California Gas Company (SoCalGas) appreciates the opportunity to provide comments on Proposed Amended Rules 1146, 1146.1, 1146.2, and Proposed Rule 1100 Transition Rules for RECLAIM Facilities. We look forward to continued engagement in the working group process as this, and other RECLAIM landing rules are developed.

Comments regarding Proposed Rule 1100

Permit Application Submittal Date

The August 1, 2018 permit application submittal deadline contained in draft Proposed Rule 1100 (PR 1100) does not provide adequate time for a regulated facility to prepare and submit a required permit application. Facilities need time to assess their equipment and determine a retrofit or replacement strategy, evaluate and estimate project costs, including ancillary activities such as necessary electrical, plumbing and/or ducting modifications. Additionally, facilities must obtain funding and management approval for these projects, perform engineering design and develop project bid specifications, and select equipment. These activities must occur before preparation and submittal of a permit application (which typically also requires bringing on a contracted entity to prepare the permit application). Depending upon type, complexity and size of a business, the time to do all of this can range from weeks to many months. At SoCalGas facilities, the above activities can take as long as 12 to 18 months.

} 3-1

As proposed in PR 1100, there are approximately 44 months between the scheduled May 2018 hearing to adopt amendments to the 1146 series rules and the final Best Available Retrofit Control Technology (BARCT) implementation date of January 1, 2022. **SoCalGas respectfully requests that the proposed permit application submittal deadline be revised to require submittal at one year from the date of Governing Board adoption of Rule 1100.** If amended in May as scheduled, this would still allow 20 and 32 months for permit issuance and construction/installation of necessary equipment to achieve compliance with the January 1, 2021 and 2022 deadlines.

3-1
cont.

General Comments Regarding the RECLAIM Transition

Permitting

SoCalGas is concerned about the transition process for Title V/major sources as we understand that there could be a lag in updating permits as facilities are transitioned out of RECLAIM and become regulated under command and control (C&C) regulations. This lag would appear to expose facilities to undue enforcement jeopardy as a facility may be responsible for complying with both C&C regulations due to the transition and requirements contained in the existing, and yet to be amended, Title V/RECLAIM permits.

3-2

We recommend that if permits cannot be updated at the time of transition, that the District consider including language in Rule 1100 that stays, or otherwise addresses, applicable requirements in the facilities' existing permits until permits can be amended.

Comments Regarding the Amendments to Rule 1146, 1146.1, 1146.2

Monitoring, Reporting & Recordkeeping

SoCalGas is concerned that the District is requiring facilities that transition out of the program to maintain existing RECLAIM program Monitoring, Reporting & Recordkeeping (MR&R) requirements even though they will be subject to command and control regulation. Transitioning facilities into a C&C regulatory regime requires those facilities to retrofit or replace existing equipment and install emissions controls to achieve BARCT standards contained in applicable C&C regulations. In many cases, this will result in emission reductions. SoCalGas believes that these reductions, and the MR&R contained in the landing rules, are sufficient to assure compliance. Therefore, retaining more costly RECLAIM MR&R, is not necessary or reasonable.

3-3

As MR&R has been a significant topic of discussion at all landing rule and RECLAIM phase-out working group meetings to date, SoCalGas recommends that the District continue to discuss this important issue so that there is consistent application of MR&R as facilities transition into a variety of landing rules. We suggest modifying the proposed 1146 series rules to include language transitioning RECLAIM facilities to current, or significantly similar, landing rule MR&R requirements and phase-out the bulk of existing RECLAIM MR&R requirements as these RECLAIM facilities fully transition to a full C&C regulatory program.

Conclusion

SoCalGas appreciates your consideration of these comments and recommendations. We look forward to continuing to work with staff regarding these amendments. Please contact me if there are any questions.

Sincerely,

A handwritten signature in black ink that reads "Daniel McGivney". The signature is written in a cursive style with a large, looping initial "D".

Daniel McGivney
Environmental Affairs Program Manager
Southern California Gas Company

cc:
Susan Nakamura, SCAQMD
Tracy Goss, SCAQMD
Gary Quinn, SCAQMD
Kevin Orellana, SCAQMD
Lauren Nevitt, SoCalGas

Response to Comment 3-1

After considering public input, the permit application submittal deadline has been extended from August 1, 2018 to twelve months after rule adoption (i.e. December 7, 2019). Staff believes the new deadline provides adequate time if a comprehensive engineering or energy assessment is needed to prepare for the required permit application.

Response to Comment 3-2

As a facility modifies its equipment, permits can be modified to reflect compliance with command-and-control rules. In the Monthly RECLAIM Working Group Meeting held on April 12, 2018, staff presented an initial plan for permitting for the RECLAIM transition. Staff will continue to work with stakeholders and will modify the schedule as needed to transition facilities to command-and-control if additional time is needed to address transitional permitting issues.

Response to Comment 3-3

Staff acknowledges that part of the existing RECLAIM MRR requirements, such as daily monitoring and reporting of emissions, and missing data provisions, are developed for a compliance program that relies on reported mass emissions to track and demonstrate compliance. Staff has evaluated the MRR requirements in both RECLAIM and Rule 1146 series, and recommends that non-Title V facilities to be subject to the MRR requirements in Rule 1146 series after exiting the RECLAIM program. For Title V facilities, an extensive public review process is triggered by modifications on monitoring and recordkeeping requirements. Staff is recommending that Title V facilities maintain existing RECLAIM MRR requirements while the transition process proceeds. The SCAQMD is committed to re-evaluate monitoring and recordkeeping requirements for Title V facilities, and will continue to discuss the matter with EPA.



February 28, 2018

Gary Quinn, P.E.
 Program Supervisor
 South Coast Air Quality Management District
 21865 Copley Drive
 Diamond Bar, CA 91765

Subject: COMMENTS TO PAR 1146 and PR 1100

Dear Mr. Quinn:

Thank you for this opportunity to comment on SCAQMD Proposed Amended Rule 1146 and Proposed Rule 1100.

Plains West Coast Terminals (PWCT) has five RECLAIM facilities – PWCT Alamitos and PWCT Dominguez Hills have two Rule 1146 heaters each, PWCT Long Beach has two out of service heaters and a Rule 1147 afterburner, PWCT Huntington Beach has an out of service heater, and PWCT El Segundo no longer has a heater on location. The last three should comply fairly easily with using the Rule 1146 (c)(5) low use provision. The first two facilities with active heaters may be able to use the low use provision however, it only allows for an 18 month compliance date if it no longer meets the exemption while Proposed Rule 1100 allows a 31 month compliance date if adopted in its current version in May 2018.

4-1

PWCT will have from one to four heaters to retrofit by January 2021. The first hurdle will be to prepare *COMPLETE* permit to construct (PTC) applications by August 1, 2018. Before an application can be prepared, there are many planning components involved. These include: engineering evaluation of the current heaters, viability of retrofitting the existing configuration, scoping out viable vendors and their guarantees for the retrofit, signing all subcontractors on an agreeable master services contract, scheduling the construction on-site with limited physical space, evaluating downtime options without interrupting our business, and more importantly budgeting this new unanticipated work in the middle of a fiscal year. We are requesting more time to provide the PTC applications, such as January 1, 2019 with a compliance date of 30 months for this major retrofit after the PTC is issued. We foresee SCAQMD staff being overly burdened with extra applications to process and feel it is unfair for us to have a shorter time to retrofit the heater due to unforeseen permitting evaluation time.

4-2

C:\My Documents\Environmental Projects\PAA\2018\PWCT 1146 - 1100 comment letter\PWCT PAR1146 Comments.docx

Plains West Coast Terminals, LLC
 5900 Cherry Avenue • Long Beach, CA 90805-4408 • (562) 728-2800 • FAX (562) 728-2860

Mr. Gary Quinn
SCAQMD
February 26, 2018
Page 2 of 2

Also while staff is evaluating the permit applications, there should be a distinction in the monitoring, recordkeeping, and reporting (MRR) requirements between NOx Title V facilities and other Title V facilities. Our facilities are in Title V because we have the potential to emit more than 10 tons per year of ROG. All the other criteria pollutants are less than 10 tons per year. Therefore, the MRR requirements should entail those listed in Rule 1146 and not in Regulation XX – RECLAIM for large sources.

} 4-3

If you have any questions, please contact me at (661) 204-8749 or Ms. Connie Cunningham at (562) 728-2024.

Sincerely,



Glen Mears
Western Division ERC Director

Cc: Kevin Orellana, SCAQMD
Kalam Cheung, SCAQMD
Connie Cunningham, PWCT

Response to Comment 4-1

Rule 1100(d)(4) allows low use units with an annual heat input less than 90,000 therms located at RECLAIM facilities, in operation prior to 12 months after date of rule adoption, to retain and comply with unit's NO_x emission limit and source testing requirements specified in the SCAQMD permit to operate as of the date of rule adoption. Units complying with Rule 1100(d)(4) must also comply with requirements of Rule 1146(c)(5) and (e)(4).

As specified in Rule 1146 (e)(4), any unit complying with low use requirements of Rule 1146(c)(5) exceeding the low use threshold of 90,000 therms of heat input in any twelve month period, shall submit required applications for permits to construct and operate within 4 months after exceedance and demonstrate and maintain compliance with applicable requirements of Rule 1146(c)(1), (c)(2), (c)(3), (c)(4), and (c)(5) for the life of the unit.

Response to Comment 4-2

After considering public input, the permit application submittal deadline has been extended from August 1, 2018 to twelve months after rule adoption (i.e. December, 2019). Staff believes the new deadline provides adequate time if a comprehensive engineering or energy assessment is needed to prepare for the required permit application. Staff highly encourages facilities to start the necessary planning, engineering design, and budgeting process early to allow for enough time after the Permit to Construct (PTC) is issued.

The compliance date specified in PR 1100 is consistent with the compliance timeframe allowed in previous Rules 1146 and 1146.1 amendments in 2008. Units that are subject to Rules 1146 and 1146.1 are grouped together in the compliance schedule to allow facilities to decide which units they can demonstrate compliance by the earlier compliance date (January 1, 2021), thereby providing them more flexibility. In addition, for any operator that commits to fully replacing the affected equipment, in lieu of installing ultra-low NO_x burners or SCR retrofit, extra time (until January 1, 2023) is allowed to comply with the existing NO_x emission limits in Rules 1146 and 1146.1.

Response to Comment 4-3

Staff acknowledges that some NO_x RECLAIM facilities are in the Title V program due to other pollutants such as VOC or PM. As discussed in Response to Comment 3-3, an extensive public review process is triggered by modifications on monitoring and recordkeeping requirements for Title V facilities. Since the RECLAIM Title V permit is a facility permit, the public review process could be triggered by changes in MRR requirements. The SCAQMD is committed to re-evaluate monitoring and recordkeeping requirements for Title V facilities, and will continue to discuss this matter with EPA.



February 28, 2018

Philip Fine, Ph.D.
Deputy Executive Officer
South Coast Air Quality Management District
21865 E. Copley Drive
Diamond Bar, CA 91765

Re: PAR1146, 1146.1, 1146.2 and PR1100

Dear Dr. Fine:

As Executive Director of the Southern California Air Quality Alliance I am providing the following comments on the proposed rules identified above.

Proposed Rule 1100

Proposed Rule 1100 currently includes a requirement that applications for permits to construct any new equipment or retrofit equipment necessary to comply with the emission standards in the 1146 series of rules be submitted by August 1, 2018. This time period is way too short for many if not all of the affected facilities. They will need adequate time to determine whether retrofits or replacements (or a combination of the two) are most appropriate, determine project costs, retain consultants to develop the appropriate engineering solution(s), obtain funding for the project, and then prepare a complete package to submit to SCAQMD in the form of the necessary permit forms and support documents. My members have advised me that this cannot reasonably be done (and done well) in the amount of time currently provided in the rule. We strongly request that additional time be provided and suggest that an appropriate amount of time is 12-18 months from the date of adoption of the proposed rules and amendments.

5-1

Proposed Amended Rule 1146, 1146.1 and 1146.2

I was very involved during the initial development and adoption of the RECLAIM program. One of the early "trade-offs" demanded by SCAQMD and EPA was extensive monitoring, recordkeeping and reporting requirements in exchange for the flexibility provided to facility operators in determining how to comply with the emission caps imposed by the RECLAIM program. With SCAQMD now moving those facilities to a command-and-control regime, facility operators are losing that flexibility. There is no longer a need to demonstrate that emissions are below arbitrary quarterly poundage limits reflected by RTC allocations since RTCs will no longer have any pertinence in the command-and-control program. Accordingly, we believe that it is only fair that the monitoring, recordkeeping and reporting requirements now applicable to facilities exiting RECLAIM be those that have traditionally been applicable to non-RECLAIM facilities and equipment.

5-2

We believe that requirements such as daily monitoring and reporting of emissions to the SCAQMD and missing data reporting have no relevancy to a

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Suite 500
Los Angeles, CA 90045
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Philip Fine, Ph.D.
February 28, 2018
Page 2

command-and-control regime and should be eliminated as soon as a facility exits RECLAIM. Only monitoring, recordkeeping and reporting that is necessary to show compliance with the emission standards in the applicable rule should be required. We believe that the Rule 1146 series rules have adequate and appropriate monitoring, recordkeeping and reporting requirements and no different or more stringent requirements are necessary or appropriate.

5-2
cont.

Compliance During Transition from RECLAIM to Command and Control

All current RECLAIM facilities have facility permits with detailed permit requirements. Those permit requirements do not reflect the requirements of the command-and-control rules and may conflict with the command-and-control rules. There needs to be a recognition somewhere in the transition rules that the command-and-control requirements take precedence and that facility operators will not be considered in violation of facility permit requirements while the permit modification process is pending.

5-3

I look forward to continuing to work with you and SCAQMD staff on these and other issues that we will confront as we move ahead with "unwinding" the RECLAIM program.

Very truly yours



Curtis L. Coleman, Esq.
Executive Director
Southern California Air Quality Alliance

Response to Comment 5-1

After considering public input, the permit application submittal deadline has been extended from August 1, 2018 to twelve months after rule adoption (i.e. December 7, 2019). Staff believes the new deadline provides adequate time if a comprehensive engineering or energy assessment is needed to prepare the required permit application.

Response to Comment 5-2

See Response to Comment 3-3.

Response to Comment 5-3

See Response to Comment 3-2.



Northrop Grumman Systems Corporation
 One Space Park
 SDS362/R9
 Redondo Beach, CA 90278

March 12, 2018

Gary Quinn,
 Program Supervisor, Planning and Rules
 21865 E. Copely Drive
 Diamond Bar, CA 91765-4182

RE: COMMENTS ON PROPOSED RECLAIM TRANSITION TO RULES 1100, 1146, and 1146.1

Dear Mr. Quinn,

Per our meeting on February 7th, Northrop Grumman Systems Corporation is hereby submitting a proposed adjusted compliance timeline for replacing equipment subject to SCAQMD Rules 1100, 1146, and 1146.1. Northrop Grumman operates multiple manufacturing centers located in the South Coast Air Basin involved in advanced development engineering and production and assembly of aircraft, satellites, electronics, and extreme high frequency semiconductors for government and military customers. This letter pertains to the El Segundo, Manhattan Beach, and Redondo Beach sites collectively known as South Bay, comprised of over 3.4 million square feet, located in the vicinity of LAX, and managed under the same operating budgets and project management personnel. Although none of these three sites are subject to the cap and trade requirements of AB32, the facility in Redondo Beach (FID 800409) does submit an abbreviated report with emissions well below the 25,000 MT CO₂e threshold for cap and trade.

We believe the transition to command and control rules is an excellent opportunity to reevaluate overall energy demand and usage. Instead of replacing like with like, a building by building robust engineering analysis would maximize this opportunity, yet it is a time-intensive endeavor. In addition, as a government contractor, Northrop Grumman is bound by specific procurement rules and requirements that significantly impede expedient vendor selection. Based on our best faith effort, we have put together what we believe to be a reasonable timeline to replace existing equipment covered under the proposed amended 1146 and 1146.1 rules.

6-1

Site	Bldg	Permit ID Number	Asset	Input rating (MMBTUH)	Year of Completion
Manhattan Beach	D1	D22	16044	2.5	Q4 2018
Manhattan Beach	D1	D314	21424	4.5	2019
Manhattan Beach	D1	D24	16043	4.5	2019
Manhattan Beach	R6	D19	19786	5	2020
Redondo Beach	S	D185	18310	2.07	2020
Redondo Beach	S	D183	18311	2.07	2021
Redondo Beach	S	D181	18312	2.07	2021
El Segundo	905	D37	B00WC011	5.23	2021
Redondo Beach	S	D179	18313	2.07	2022
Redondo Beach	F1	D90	3000	5	2022
Redondo Beach	S	D187	18309	3	2023
Redondo Beach	R7	D102	8449	2.7	2023

We recognize that facilities covered under AB617 need to meet the 1/1/2021 and 1/1/2022 compliance deadlines, but we strongly believe a minor extension will allow facilities like ours to further explore opportunities, maximizing our emission reductions. Under our proposed timeline our three facilities would achieve 100% compliance by January 1 of the following years:

- Manhattan Beach (FID 800408) – **2021**
- El Segundo (FID 18924) – **2022**
- Redondo Beach (FID 800409) – **2024**

6-1
cont.

If you have any questions or need additional information please don't hesitate to contact the undersigned at Matthew.Kent@ngc.com or at the number provided below.

Sincerely,
NORTHROP GRUMMAN SYSTEMS CORPORATION



Matthew Kent
Air Quality Engineer
Aerospace Systems
(310) 812-9698

Response to Comment 6-1

The compliance date specified in PR 1100 is consistent with the compliance timeframe allowed in previous Rules 1146 and 1146.1 amendments in 2008. Units that are subject to Rules 1146 and 1146.1 at a facility are grouped together in the compliance schedule to allow facilities to decide which units they can demonstrate compliance by the earlier compliance date (January 1, 2021), thus providing them more flexibility. In addition, for any operator that commits to fully replacing the affected equipment, in lieu of installing ultra-low NOx burners or SCR retrofits, extra time (January 1, 2023) is allowed to comply with the existing NOx emission limits in Rules 1146 and 1146.1.

 Fri 4/20/2018 1:31 PM
Jiang, Hao <Hao.Jiang@disney.com>
PAR Rule 1100 comment

To Kevin Orellana; Kalam Cheung
Cc Tracy Goss; Gary Quinn

Kevin and Kalam,

Disneyland would appreciate the District to consider sunseting RECLAIM MRR requirements after Title V facilities fully integrated into command-and-control rules, as proposed below. This is to avoid unnecessary and duplicated MRR requirements as current in PAR Rule 1100 to Title V facilities.

R1100(d)(4): All Title V facilities subject to this rule shall comply with the monitoring, reporting, and recordkeeping requirements specified in Rule 2012 until six months after the applicable compliance date specified in Rule 1100 – Implementation Schedule for NOx Facilities.

} 7-1

Thank you!

Hao Jiang, P.E.
Environmental Affairs
Disneyland Resort
PO Box 3232
TDA 224C
Anaheim, Ca 92802
714-781-4504, hao.jiang@disney.com

Response to Comment 7-1

As discussed in Response to Comment 3-3, an extensive public review process is triggered by modifications on monitoring and recordkeeping requirements for Title V facilities. The SCAQMD is committed to re-evaluate monitoring and recordkeeping requirements for Title V facilities, and will continue to discuss this with EPA. Staff is recommending that Title V facilities to maintain existing RECLAIM MRR requirements while the transition process proceeds. Staff intends to return to PR 1100 (d)(4) as the MRR requirements for Title V facilities exiting the RECLAIM program are addressed.

Subject: Comments on PR 1100 and 1146.x

Dear Tracy,

I am writing to reiterate some issues that I and others raised in the Public Workshop today.

- 1. The costs incorporated into the cost effectiveness calculations should include additional permit to operate fees in the operating costs for additional permit units such as for Selective Catalytic Reduction (SCR). } 8-1
- 2. One problem we foresee is that in the case where a burner must be replaced due to a failure, the rules as currently drafted would trigger the lower emission limits. We are concerned that the SCAQMD would require a permit to construct for this installation, which would keep the affected unit shut down for several months or more while the permit application is prepared and then processed. Normal burner replacement if done with an identical burner would not require a permit. Perhaps the rule could have language addressing this issue. I confess I do not have a good recommendation at this point. } 8-2

Thanks for listening!

Best regards,

Joe

Joseph Hower, PE, DEE

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Response to Comment 8-1:

Staff has updated cost-effectiveness calculations reflected in the staff report to include additional recurring permitting costs.

Response to Comment 8-2:

Objective of the rule provision is to allow burner (currently in compliance) to operate through its useful life and for facility to bear the cost of a new burner only upon burner replacement. Burners that fail ahead of the 15 years will need to be replaced to meet new emission limits. Before a burner becomes inoperable, the burner or boiler performance will suffer and show signs of wear and tear, which would be shown in the various operating parameters. For example, a review of higher fuel usage or even a Visible Emission Evaluation (VEE) at the smoke stack could indicate a problem with the burner assembly. Once a determination that the boiler is suffering a performance problem, an overall evaluation of the boiler should take place. Overall, if there are signs of a potential problem, routine maintenance should be able to ascertain the problem well ahead of time for planning purposes.

Subject: SCAP Comments on PARs Series 1146

Hi Kevin,

Southern California Alliance of Publicly Owned Treatment Works (SCAP) appreciates the opportunity to provide comments on Proposed Amended Rules 1146/1146.1/1146.2. We also appreciate the acknowledgement that BARCT for digester gas will remain at 15 ppm NOx. However, we have concerns about the ability for dual fuel boilers using digester gas and/or natural gas to achieve the proposed limit. Ultra-low NOx burners are very sensitive, which makes it extremely challenging to operate when the proportion of digester gas to natural gas is altered. The proposal to lower the natural gas NOx limit will by default lower the dual fuel weighting limit and would likely restrict dual fuel use at wastewater treatment plants. To address this concern, SCAP respectfully requests that dual fuel boilers at wastewater treatment plants be allowed to use the existing natural gas NOx limits for the weighted limit formula, if the natural gas limits are lowered.

} 9-1

Our members have also expressed concerns about the feasibility of reducing the NOx limit to 7ppm on existing natural gas only boilers. We are concerned that the proposed limit might not be achievable when retrofitting a boiler. Our members use both natural gas and digester gas boilers to heat anaerobic digesters. In order to treat wastewater, our digesters need a reliable source of heat. Accordingly, we respectfully request that the viability of 7ppm NOx burners be carefully validated. In our experience vendors have difficulty delivering reliable retrofit technology, so we believe a detailed review of actual installations that have achieved the proposed limit using retrofitted burners is critical, especially for essential public services.

} 9-2

Thank you again for the opportunity to provide comments and please let me know if you have any questions regarding our concerns.

Sincerely,

David

DAVID L. ROTHBART, P.E., BCEE
SCAP Air Quality Committee Chair
Supervising Engineer | Air Quality Engineering
SANITATION DISTRICTS OF LOS ANGELES COUNTY | 1955 Workman Mill Road, Whittier, CA 90601
Phone: 562.908.4288 x2412 | Cell: 714.878.9655 | FAX: 562.692.9690
Converting Waste Into Resources | www.LACSD.org

Response to Comment 9-1:

Staff acknowledges the unique challenges faced by sewage treatment facilities and landfills offering essential public services and has initiated rulemaking efforts to establish an industry specific rule for equipment located at aforementioned facilities in order to address stakeholder concerns. Natural gas fired equipment in compliance with current NOx emission limits will not have to comply with new NOx emission limits until the time of burner replacement or 15 years after rule amendment.

Response to Comment 9-2:

Staff has been in contact with five equipment vendors throughout the rulemaking process. Three out of the five vendors expressed that 7 ppm burner retrofits are feasible. SJVAPCD adopted Rule 4320 on October 16, 2008 which implemented NOx emission limits of between 7 to 9 ppm for all natural gas fired units rated to >5 MMBtu/hr. Approximately 980 units (between 5 to 300 MMBtu/hr) located in SJVAPCD were identified and source tested to comply with 7 ppm limit without use of the mitigation fee option. Over 1,000 source test reports from equipment located in SCAQMD and SJVAPCD support the information received from vendors that 7 ppm limit is feasible for new and retrofit equipment.



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September 25th, 2018

SCAQMD
21865 Copley Drive
Diamond Bar CA 91765

Attention: Mr. Tracy Goss, P.E
Manager

Subject: Comments RE: PR-1100

Dear Mr. Goss;

Appended below are some points regarding the Proposed rRle 1100 and preliminary draft of the staff report dated September 2018. I would appreciate the District respond to the comments listed below:

- 1. Economics analysis and Cost effectiveness of the proposed rule is not included. We would appreciate the opportunity to comment on the costs of equipment, replacement, installation and operation. } 10-1
- 2. Atmospheric fired units (Parker Boilers) less than 10.0-MMBTU per hour input should also be subject to the Proposed 7-PPM NOx limit from current 12-PPM. In fact, they should have been subjected to meet current 9-PPM NOx emissions already. Currently 9-PPM technology does exist and can be adopted for these units. No Manufacturer should receive special treatment over their competition. } 10-2
- 3. Source test reports of Ultra Low NOx burner installation outside this air basin need validation by the AQMD Source Testing Division. Copy of their reports need to be made public. Transperency of these source tests reports is necessary for proper goverence. } 10-3

We are available to discuss the above comments and concerns at your convenience.

Please feel free to contact me at 714-984-5479 or email at Imran@boilerdynamics.com.

Sincerely,

Imran Husain-Tech Sales & Marketing
Boiler Dynamics, Inc

Encl; as above
Cc; Gary Quinn-PE-Program Supervisor

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Response to Comment 10-1:

Staff cost assumptions used to determine cost-effectiveness were presented in Working Group #5 on August 2nd, 2018 ,Working Group #7 on October 16th, 2018, and Chapter 2 of this staff report.

Response to Comment 10-2:

Staff has conducted a comprehensive BARCT analysis for boilers, process heaters and steam generators subject to Rule 1146 and 1146.1 operating within the district including atmospheric units rated between 2 to 10 MMBtu/hr. Source test results reviewed were not able to provide sufficient data to support establishment of 9 ppm BARCT. It is important to note that the current limit for atmospheric units in SJVAPCD Rule 4307 is also 12 ppm.

Staff has met with the commentor for additional information. Commentor's comments are addressing new units and not retrofits.

Response to Comment 10-3:

Equipment source test reports obtained from outside of SCAQMD were conducted using EPA approved test methods. For example, SJVAPCD source tests follow CARB Method 100 which is considered equivalent to SCAQMD Method 100.1. Information can be obtained through public records requests.

From: McGivney, Daniel [<mailto:DMcGivney@semprautilities.com>]
Sent: Thursday, October 4, 2018 9:42 AM
To: Kalam Cheung <kcheung@aqmd.gov>; Gary Quinn <GQuinn@aqmd.gov>
Cc: Nevitt, Lauren B <LNeVitt@semprautilities.com>; Fickerson, Karin U <kFickerson@semprautilities.com>
Subject: Comment regarding PAR 1146 Series Rules Package

Kalam, Gary, per yesterday's conversation with Kalam, SoCalGas is providing a recommendation for consideration, regarding the definition of "Thermal Fluid Heater" which occurs in both Rules 1146 and 1146.1. SoCalGas understands that the current definition, aside from the proposed amended version which now includes the phrase "natural gas fired," has been in the these rules for quite some time. However, we believe that the definition does not accurately describe or distinguish a thermal fluid heater from a process heater, and would better accomplish that if it was further amended as noted below. Recognizing this request is fairly late in the process, SoCalGas would appreciate the District review this request and consider including SoCalGas' proposed language in the current proposed amendments scheduled to go before the Governing Board at its December 2 Board meeting. Should staff wish to discuss this proposal further, or if there are any questions, please contact me. Thank you.

SoCalGas Proposed Definition: THERMAL FLUID HEATER means a natural gas fired PROCESS HEATER in a system in which a process stream is heated indirectly by a heated fluid other than water.

Explanation: The proposed change to the thermal fluid heaters definition clarifies that the process streams are not inside the thermal fluid heater. Thermal fluid heaters work harder than process heaters or water heaters because the thermal fluid typically needs to be heated to higher temperatures than process streams or water. The slightly higher NOx limit for these units is justified because they heat the fluids to higher temperatures, and we want to assure it is clear which units are in this category.

Daniel McGivney
Environmental Affairs Program Manager
Southern California Gas Company
951-225-2958
dmcgivney@semprautilities.com

11-1

Response to Comment 11-1

SCAQMD staff appreciates your comments and participation throughout the rulemaking for PAR 1146 series and PR 1100.