

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Staff Report

Proposed Amended Rule 1147 - NO_x Reductions from Miscellaneous Sources

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Deputy Executive Officer

Planning, Rule Development, and Area Sources
Sarah Rees, Ph.D.

Assistant Deputy Executive Officer

Planning, Rule Development, and Area Sources
Michael Krause

Acting Planning and Rules Manager

Planning, Rule Development, and Area Sources
Heather Farr

Author: Shawn Wang – Air Quality Specialist

Contributors: Jason Aspell – Deputy Executive Officer
Al Baez- Program Supervisor
Ryan Banuelos – Air Quality Specialist
Jack Cheng – Senior Enforcement Manager
Erwin dela Cruz – Supervising Air Quality Engineer
Azar Dabiri - Senior Air Quality Engineering Manager
Shah Dabirian, Ph.D. – Program Supervisor
Bahareh Farahani – Senior Air Quality Engineer
Mitch Haimov – Senior Air Quality Engineering Manager
Nicole Idiart – Air Quality Engineer
Sinae Kim - Supervising Air Quality Engineer
Thomas Liebel - Senior Air Quality Engineering Manager
Simin Mehrabani - Senior Air Quality Engineer
Kevin Orellana – Senior Enforcement Manager
Barbara Radlein – Program Supervisor
Amanda Sanders – Air Quality Analysis and Compliance Supervisor
Angela Shibata – Supervising Air Quality Engineer
Brian Vlasich – Air Quality Specialist
Jillian Wong, Ph.D. – Assistant Deputy Executive Officer
Yanrong Zhu – Air Quality Specialist

Reviewed by: Gary Quinn, P.E. – Program Supervisor
Brian Tomasovic – Principal Deputy District Counsel

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EXECUTIVE OFFICER:

WAYNE NASTRI

TABLE OF CONTENTS

EXECUTIVE SUMMARY	EX-1
CHAPTER 1: BACKGROUND	1-1
INTRODUCTION	2
REGULATORY HISTORY	2
<i>Rule 1147 – NOx Reductions from Miscellaneous Sources</i>	3
<i>AB 617</i>	6
AFFECTED INDUSTRIES	6
PUBLIC PROCESS.....	7
CHAPTER 2: BARCT ASSESSMENT	2-1
BARCT ASSESSMENT.....	2
ASSESSMENT OF SOUTH COAST AQMD REGULATORY REQUIREMENTS	2
ASSESSMENT OF NOX EMISSION LIMITS FOR EXISTING UNITS.....	3
<i>Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator</i>	3
<i>Remediation Unit</i>	4
<i>Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner</i>	5
<i>Evaporator, Fryer, Heated Process Tank, or Parts Washer</i>	6
<i>Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank</i>	7
<i>Tenter Frame or Fabric or Carpet Dryer</i>	8
<i>Autoclave</i>	9
<i>Tunnel Kiln and Tunnel Dryer</i>	10
<i>Natural Gas Fired Chillers</i>	11
<i>Turbine <0.3 MW (Natural Gas)</i>	11
<i>Turbine <0.3 MW (Distillate)</i>	12
<i>Rotary Dryer</i>	13
OTHER REGULATORY REQUIREMENTS	13
ASSESSMENT OF POLLUTION CONTROL TECHNOLOGIES	14
INITIAL BARCT RECOMMENDATIONS AND ADDITIONAL CONSIDERATIONS	16
COST-EFFECTIVENESS AND INCREMENTAL COST-EFFECTIVENESS ANALYSIS	17
PROPOSED BARCT EMISSION LIMIT	21
CHAPTER 3: SUMMARY OF PROPOSALS	3-1
INTRODUCTION	2
PROPOSED AMENDED RULE 1147.....	2
CHAPTER 4: IMPACT ASSESSMENT	4-1
INTRODUCTION	2
EMISSIONS REDUCTION	2
SOCIOECONOMIC ASSESSMENT	2
CALIFORNIA ENVIRONMENTAL QUALITY ACT ANALYSIS	5
DRAFT FINDINGS UNDER CALIFORNIA HEALTH AND SAFETY CODE SECTION 40727	6
COMPARATIVE ANALYSIS.....	7
APPENDIX A: COMMENTS AND RESPONSES.....	A-1

EXECUTIVE SUMMARY

Proposed Amended Rule (PAR) 1147 – NO_x Reductions from Miscellaneous Sources, seeks further emission reductions of oxides of nitrogen (NO_x) and is part of a suite of “landing” rules for facilities currently regulated under the Regional Clean Air Incentives Market (RECLAIM) program or under another existing source specific rule. The goal is to conduct an updated Best Available Retrofit Control Technology (BARCT) analysis to ensure affected equipment is feasibly controlled to achieve cost effective maximum emission reductions. Control Measure CMB-05 of the Final 2016 Air Quality Management Plan (AQMP) directed staff to assess how to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable and to achieve a five tons per day NO_x emission reduction as soon as feasible but no later than 2025.

PAR 1147 will primarily update NO_x emission limits for existing equipment categories, as well as establish new equipment categories based on stakeholder comments. PAR 1147 will include a newly added carbon monoxide (CO) limit for RECLAIM and non-RECLAIM equipment with additional requirements for monitoring and recordkeeping. The proposed NO_x emission limits for existing categories and new emission limits for added equipment categories represent BARCT. The proposed amended rule will update compliance dates and new limits for NO_x and CO emissions for RECLAIM, non-RECLAIM, and former RECLAIM facilities.

The current Rule 1147 regulates NO_x emissions from miscellaneous combustion equipment that range from a wide variety of industries, such as automotive body shops to large industrial manufacturing facilities, at limits ranging between 30 to 60 ppm depending on equipment type and process temperature. PAR 1147 would affect roughly 5,300 units located at approximately 3,000 facilities. After a comprehensive BARCT assessment including analysis of technology feasibility and cost effectiveness, PAR 1147 proposes to lower limits in some equipment categories to 20 to 30 ppm while others remain at the existing Rule 1147 levels of 30 to 60 ppm. In addition, a limit on CO emissions is being proposed. Rulemaking for PAR 1147 spanned over 11 working group meetings and additional meetings were held with industry stakeholders to obtain feedback during rule development.

Implementation will primarily take place when the equipment has reached a certain age recognizing typical replacement periods as well as addressing stranded assets from that equipment with controls installed to meet existing Rule 1147 limits. In addition, the applicability has been expanded to include equipment currently under the RECLAIM program as the facilities transition to become former RECLAIM facilities. More specifically, the equipment meeting current limits would be required to submit permit applications to meet the proposed emission limits by July 1 of the year after the unit burner becomes 32 years old. Owners or operators of units that are not in compliance with the existing Rule 1147 NO_x limits must submit applications to meet the proposed emission limits by July 1, 2023, or July 1 of the year after unit burner becomes 12 years old, whichever is later. The compliance deadlines for PAR 1147 were established by taking into consideration equipment size range, application type, the number of units per facility, and whether facilities had multiple pieces of equipment subject to multiple source-specific command-and-control rules. The total emissions inventory for the PAR 1147 universe is ~3.69 tons per day (tpd). Emission reductions from the facilities expected to submit permit applications by July 1, 2023 are estimated to be ~0.54 tpd by January 1, 2026 and expected total reductions from the Proposed Amended Rule 1147 universe are expected to be 1.59 tpd by the full implementation estimate of January 1, 2059.

CHAPTER 1: BACKGROUND

Introduction
Regulatory History
Affected Industries
Public Process

Introduction

The Regional Clean Air Incentives Market (RECLAIM) program was adopted in October 1993 under Regulation XX. RECLAIM is a market-based emissions trading program designed to reduce NO_x and SO_x emissions and includes facilities with NO_x or SO_x emissions greater than 4 tons per year. The 2016 Final Air Quality Management Plan (2016 AQMP) included Control Measure CMB-05: Further NO_x Reductions from RECLAIM Assessment (CMB-05) to ensure the NO_x RECLAIM program was achieving equivalency with command-and-control rules that are implementing Best Available Retrofit Control Technology (BARCT) and to generate further NO_x emission reductions at RECLAIM facilities. The adoption resolution for the 2016 AQMP directed staff to achieve five tons per day of 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 BARCT as soon as practicable.

As facilities transition out of NO_x RECLAIM, a command-and-control rule that includes NO_x emission standards that reflect BARCT is needed for all equipment categories. Proposed Amended Rule (PAR) 1147 – NO_x Reductions from Miscellaneous Sources is a “landing” rule for RECLAIM facilities with permitted combustion sources that are not subject to another South Coast AQMD Regulation XI rule and will establish NO_x and CO emission limits for equipment subject to the rule at RECLAIM, non-RECLAIM, and former RECLAIM facilities.

Background

Rule 1147 – NO_x Reductions for Miscellaneous Sources applies to all permitted combustion equipment not subject to another South Coast AQMD Regulation XI rule. Impacted equipment from a wide range of industries and equipment heat input varies from below 2 million BTU/hr (MMBtu/hr) to over 80 MMBtu/hr. Currently Rule 1147 consists of nine different categories for gaseous fuel-fired combustion equipment and one additional category for liquid fuel-fired combustion equipment. Each equipment category has its own unique challenges and staff has received feedback from stakeholders regarding unique challenges with certain equipment types in existing categories. As a result, PAR 1147 proposes to pull equipment from some existing categories into their own equipment categories.

Regulatory History

The South Coast AQMD Governing Board adopted the RECLAIM program in October 1993. Regulation XX – Regional Clean Air Incentives Market (RECLAIM) 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 for RECLAIM facilities. RECLAIM replaced a series of existing and future command-and-control rules and was designed to achieve BARCT in aggregate. At the start of RECLAIM, facilities received an allocation of RECLAIM Trading Credits (RTCs). At the end of each compliance year, facilities are required to hold RTCs that are equal to or greater than their actual annual emissions.

Under RECLAIM, facilities can install pollution controls to reduce NO_x emissions or buy or trade RTCs. Any unused RTCs from over control, reduction in throughput, or equipment shutdowns, can be sold or traded. Allocations were based on the facility’s reported emission rate since there were no proposed BARCT limits at the time. In response to concerns regarding actual emission reductions and implementation of BARCT under RECLAIM, Control Measure CMB-05 of the 2016 AQMP committed to an assessment of the RECLAIM program to achieve further NO_x emission reductions of five tons per day, including actions to transition the program and ensure future equivalency to command-and-control regulations. During the adoption of the 2016 AQMP,

the adoption resolution directed staff to modify Control Measure CMB-05 to achieve the five tons per day NO_x emission reduction as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT-level controls as soon as practicable. PAR 1147 is needed to transition RECLAIM facilities with miscellaneous sources equipment to a command-and-control regulatory structure. PAR 1147 will apply to facilities while in RECLAIM and after the facility transitions out of RECLAIM and becomes a former RECLAIM facility.

Rule 1147 – NO_x Reductions from Miscellaneous Sources

Rule 1147 was initially adopted in December 2008 and established NO_x limits for a wide variety of miscellaneous combustion sources at non-RECLAIM facilities. Rule 1147 applies to ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with NO_x emissions that require a South Coast AQMD permit and are not specifically required to comply with a NO_x emission limit designated by other South Coast AQMD Regulation XI rules.

- December 2008 - Rule 1147 was adopted.
- September 2011 - Rule 1147 was amended to respond to compliance challenges by delaying compliance dates as well as providing alternative compliance pathways and reducing testing requirements for impacted equipment. The rule amendment also required staff to conduct a technology assessment for small combustion sources impacted by the rule.
- February 2017 - Staff conducted a technology assessment focused on low-use equipment emitting less than one-pound NO_x per day. The completed Technology Assessment was reviewed by an independent third-party consultant as well as the Rule 1147 Task Force.
- July 2017 - Rule 1147 was amended to reflect findings and recommendations from the Technology Assessment conducted in February 2017. This amendment provided additional compliance flexibility by including an exemption for equipment with heat input ratings of less than 325,000 BTU/hr. The amendment also removed the in-use requirement for low-use equipment, modified emission limits for various equipment categories in line with findings from the February 2017 Technology Assessment and provided additional compliance options for impacted equipment.

Under Rule 1147, applicable equipment subject to 1147 with total heat input greater than or equal to 325,000 BTU/hr must meet Rule 1147 NO_x concentration limits depending on equipment category and process temperature as shown in Table 1-1 - NO_x Emission Limit for Unit Heat Ratings \geq 325,000 BTU/hour.

Table 1-1 – NOx Emission Limit for Unit Heat Ratings ≥ 325,000 BTU/hour

Equipment Category(ies)	NOx Emission Limit		
	PPM @ 3% O ₂ , dry or Pound/mmBtu heat input		
	Process Temperature		
Gaseous Fuel-Fired Equipment	≤ 800° F	> 800 ° F and < 1200° F	≥ 1200 ° F
Asphalt Manufacturing Operation	40 ppm	40 ppm	
Afterburner, Degassing Unit, Remediation Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator ¹	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Evaporator, Fryer, Heated Process Tank, or Parts Washer	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	
Metal Heat Treating, Metal Melting Furnace, Metal Pot, or Tar Pot	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	30 ppm or 0.036 lb/mmBtu	30 ppm or 0.036 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Make-Up Air Heater or other Air Heater located outside of building with temperature controlled zone inside building	30 ppm or 0.036 lb/mmBtu	30 ppm or 0.036 lb/mmBtu	
Tenter Frame or Fabric or Carpet Dryer	30 ppm or 0.036 lb/mmBtu		
Other Unit or Process Temperature	30 ppm or 0.036 lb/mmBtu	30 ppm or 0.036 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Liquid Fuel-Fired Equipment	≤ 800° F	> 800 ° F and < 1200° F	≥ 1200 ° F
All liquid fuel-fired Units	40 ppm or 0.053 lb/mmBtu	40 ppm or 0.053 lb/mmBtu	60 ppm or 0.080 lb/mmBtu

1. Emission limit applies to burners in units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a unit. The emission limit applies solely when burning 100% fuel and not when the burner is incinerating air toxics, VOCs, or other vapors. The unit shall be tested or certified to meet the emission limit while fueled with natural gas.

All in-use equipment subject to Rule 1147 with a total heat input greater than 325,000 BTU/hr and emitting one pound or more of NOx per day must demonstrate compliance with Rule 1147 limits according to the schedule outlined below in Table 1-2 – Rule 1147 Compliance Schedule.

Table 1-2 – Rule 1147 Compliance Schedule (≥ 1 lb/Day of NO_x)

Equipment Category(ies)	Submit Permit Application	Unit Shall Be in Compliance
Specific UNIT		
Remediation UNIT manufactured and installed prior to March 1, 2012	Seven months prior to a combustion system modification, combustion system replacement or unit replacement or a relocation.	Upon combustion system modification, combustion system replacement or unit replacement or relocation beginning March 1, 2012
Evaporator, heated process tank, or parts washer with a District permit issued and operating prior to January 1, 2014	Seven months prior to combustion system modification, combustion system replacement or unit replacement	Upon combustion system modification, combustion system replacement or unit replacement
Tar Pot		All new permit applications beginning January 1, 2013
UNIT with Emissions ≥ 1 Pound/Day		
Afterburner, degassing unit, catalytic oxidizer, thermal oxidizer, vapor incinerator, fryer, or spray booth make-up air heater manufactured prior to 1998	December 1, 2013	July 1, 2014
Other UNIT manufactured prior to 1986	December 1, 2011	July 1, 2012
Other UNIT manufactured prior to 1992	December 1, 2011	July 1, 2012
Other UNIT manufactured prior to 1998	December 1, 2012	July 1, 2013
Any UNIT manufactured after 1997	December 1 of the year prior to the compliance date	July 1 of the year the unit is 15 years old

All new equipment subject to Rule 1147 is required to demonstrate compliance with the rule limit existing at the time of permitting. Units emitting less than one pound per day of NO_x are required to demonstrate compliance with applicable Rule 1147 limits when the unit becomes 35 years old unless opting to demonstrate NO_x emissions of less than one pound per day through biennial emissions testing. Rule 1147 does not have periodic monitoring requirements. RECLAIM Rule 2012 requires periodic monitoring and bi-annual tune ups with the frequency determined by the source categorization of Major, Large or Process sources:

- Major sources are required to install CEMS with daily, monthly, quarterly, and annual reporting with minimum of semi-annual RATA
- Large sources are required to conduct source testing every 3 years with requirement for bi-annual tune up
- Process sources are required to conduct source testing every 5 years with requirement for bi-annual tune up

Rule 1147 does not contain a CO emission limit requirement, but units are generally subject to a limit of 2000 ppm corrected to 3% oxygen by South Coast AQMD Rule 407 – *Liquid and Gaseous Air Contaminants* or are subject to lower CO limits through BACT.

AB 617

On July 26, 2017, Governor Brown signed AB 617 (Cristina Garcia): Nonvehicular air pollution: criteria air pollutants and toxic air contaminants. AB 617 was companion legislation to AB 398 which extended California’s cap and trade program for reducing greenhouse gas emissions from stationary sources. RECLAIM facilities that are part of the cap-and-trade program are now also subject to the requirements of AB 617. AB 617 requires an expedited schedule for implementing BARCT for cap-and-trade facilities. Under AB 617, the State’s air districts were to develop a schedule by January 1, 2019 for the implementation of BARCT no later than December 31, 2023. The schedule must give highest priority to those permitted units that have not modified emissions-related permit conditions for the greatest period and does not apply to an emissions unit that has implemented BARCT due to a permit revision or a new permit issuance since 2007.

Affected Industries

PAR 1147 would affect RECLAIM and non-RECLAIM facilities that own or operate permitted gaseous fuel-fired equipment that are not subject to another South Coast AQMD Regulation XI rule. Based on South Coast AQMD permitting data, staff identified approximately 5,300 pieces of equipment located at approximately 3,000 facilities that are subject to PAR 1147. Of the estimated 3,000 facilities, 85 are identified to be participants of the RECLAIM program. A breakdown of impacted industries for RECLAIM equipment is shown in Figure 1-1 and shown for non-RECLAIM equipment in Figure 1-2. Based on equipment data, RECLAIM facilities show higher representation in the Manufacturing sector while non-RECLAIM facilities show higher representation in the Services sector.

Figure 1-1 –Industry Breakdown for RECLAIM Facilities Subject to PAR 1147

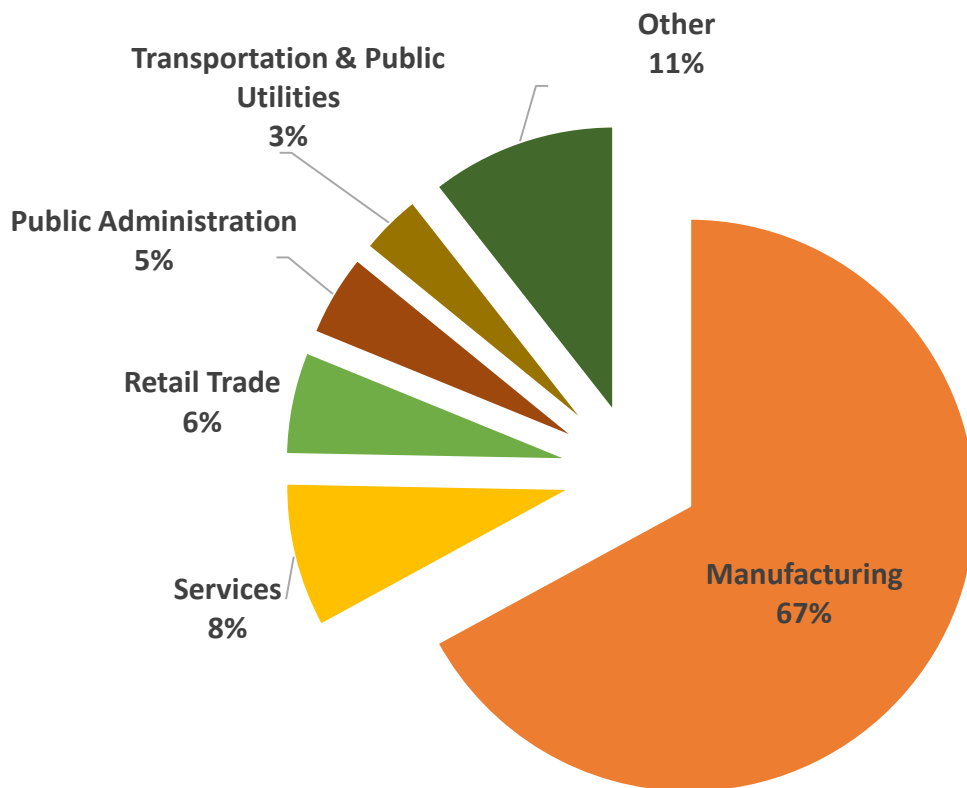
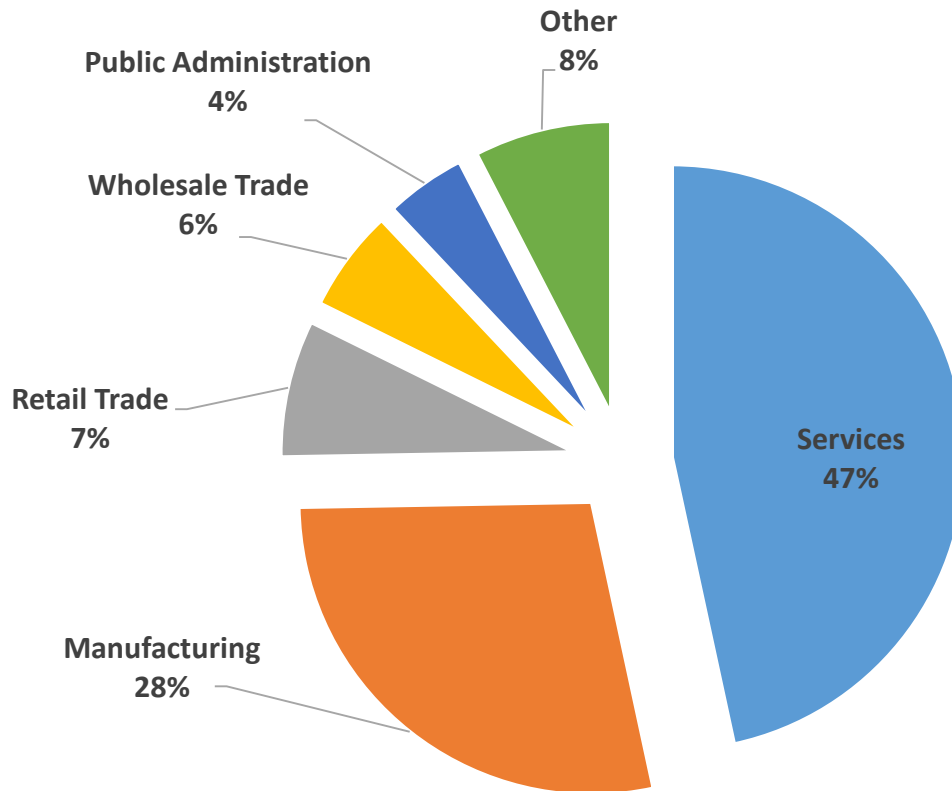


Figure 1-2 –Industry Breakdown for Non-RECLAIM Facilities Subject to PAR 1147**Public Process**

Development of PAR 1147 was conducted through a public process. South Coast AQMD staff has held eleven Working Group Meetings. Staff recognized the challenges businesses and other stakeholders have experienced with the global COVID-19 pandemic and have conducted Working Group Meetings remotely via Zoom consistent with Governor Newsom's Executive Order N-29-20 dated March 17, 2020. In person Working Group Meetings were held February 28, 2019, April 17, 2019, May 30, 2019, October 23, 2019, and February 11, 2020. Remote Working Group Meetings were held on May 14, 2020, November 12, 2020, March 10, 2021, July 14, 2021, September 8, 2021, January 5, 2022. The Working Group is composed of representatives from the equipment manufacturers, trade organizations, permit stakeholders, businesses, environmental groups, public agencies, consultants, and other interested parties. The purpose of the Working Group Meetings was to discuss proposed concepts and to work through the details of staff's proposal. A Public Workshop was held on January 27, 2022. Staff has also had numerous individual meetings with stakeholders who will be impacted by this rulemaking.

CHAPTER 2: BARCT ASSESSMENT

BARCT Assessment

Assessment of NO_x Emission Limits for Existing Units

Cost-Effectiveness and Incremental Cost-Effectiveness Analysis

Proposed BARCT Emission Limit

BARCT Assessment

Health & Safety Code §40406 defines BARCT as follows:

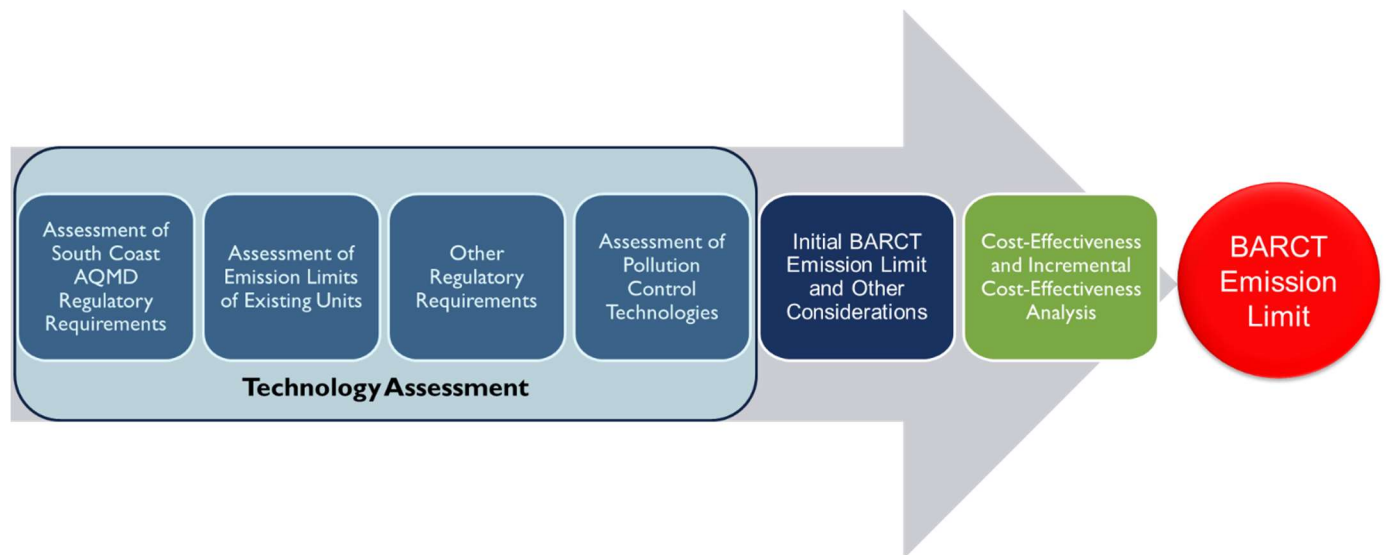
Best Available Retrofit Control Technology means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.

The California Health and Safety Code Section 40920.6 establishes requirements prior to adopting rules or regulations regarding retrofit control technologies. Some of these requirements include:

- Identifying one or more potential control options which achieves the emission reduction objective for the regulation.
- Reviewing the information developed to assess the cost-effectiveness of the potential control option, where cost-effectiveness is defined as the cost, in dollars, of the potential control option divided by emission reduction potential, in tons (i.e., the amount of dollars per ton of NOx reduced).
- Calculating the incremental cost-effectiveness for the potential control options is defined as the difference in the costs divided by the difference in the emission reduction potential between each progressively more stringent potential control option as compared to the next less expensive control option.

The BARCT technology assessment for applicable PAR 1147 equipment included a technology assessment that included assessment of existing regulatory requirements, existing NOx limits that have been achieved, and review of commercially available NOx emission reduction technologies. After staff conducts the technology assessment, potential control options are identified. Before the proposed BARCT limit is established, staff will evaluate the cost-effectiveness and incremental cost-effectiveness. A summary of the BARCT assessment is provided below in Figure 2-1.

Figure 2-1 – Summary of BARCT Assessment



Assessment of South Coast AQMD Regulatory Requirements

As part of the BARCT assessment, staff reviewed NOx limits in Rule 1147 which regulate NOx emissions from ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators,

distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with nitrogen oxide emissions that require a South Coast AQMD permit and are not specifically required to comply with a nitrogen oxide emission limit by other South Coast AQMD Regulation XI rules. The current rule emission limits were adopted on July 7, 2017 and all NO_x concentration limits specified in Rule 1147 are referenced at 3 percent volume stack gas oxygen on a dry basis.

Under Rule 1147, applicable equipment with a total heat input greater than or equal to 325,000 BTU/hr must meet the NO_x limit depending on equipment category and process temperature as shown in Table 1-1 - NO_x Emission Limit for Unit Heat Ratings \geq 325,000 BTU/hour. Based on stakeholder feedback, staff proposes to shift equipment currently subject to the oven, dehydrator, dryer, heater, kiln, calciner, cooker, roaster, furnace, or heated storage tank category into additional equipment categories for tunnel kilns, absorption chillers, and autoclaves. Based on assessment of equipment located in RECLAIM facilities, PAR 1147 would also include a new equipment category for stationary gas turbines below 0.3 megawatts.

Assessment of NO_x Emission Limits for Existing Units

As part of the BARCT analysis for PAR 1147, permit limits were reviewed for all applicable categories. In addition to the assessment of permit limits, additional assessment was conducted from available source test results for each new and existing equipment category. The objective of this part of the technology assessment was to ascertain if current permitted emission limits and source tested results are at a lower level than the NO_x limit established in Rule 1147. The analysis also identified other control technologies implemented by permitted equipment to achieve the designated permit limits or better. Due to the wide variety of equipment found in certain equipment categories, additional considerations were made regarding application and equipment configuration. The equipment category impacting make-up air heaters or other air heaters was evaluated previously during the 2017 Technology Assessment¹ for Rule 1147 equipment and staff's assessment was in line with the 2017 technology assessment; therefore, this equipment category was not re-evaluated during this rulemaking. Concentration limits referenced in this assessment shall be corrected to 3% oxygen except for turbines which are corrected to 15% oxygen.

Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator

The category for afterburner degassing unit, remediation unit, thermal oxidizer, catalytic oxidizer or vapor incinerator consists of 327 total units with 267 units located at non-RECLAIM facilities and 62 units located at RECLAIM facilities. Units in this category are used as control equipment for volatile organic compounds and other air toxics. The total heat input for equipment found in this category ranges between less than 1 MMBtu/hr to 189 MMBtu/hr. Emission limits for this category apply to burners in units fueled by 100% natural gas that are used to heat a unit or to incinerate air toxics, VOCs, or other vapors. The emission limit applies solely when burning 100% fuel and not when the burner is incinerating air toxics, VOCs, or other vapors. Units in this category demonstrate compliance by being tested or certified to meet the emission limit while fueled with natural gas.

Permit Limits

¹ July 7, 2017 South Coast AQMD Governing Board Meeting Agenda Item 36 – Certify the Final Subsequent Environmental Assessment and Amend Rule 1147 – NO_x Reductions from Miscellaneous Sources: [36. Certify the Final Subsequent Environmental Assessment and Amend Rule 1147 - NO_x Reductions from Miscellaneous Sources \(aqmd.gov\)](#)

Permit limits of existing permitted equipment in this category range between 12 ppm to 135 ppm. While existing Rule 1147 limit for this category is 60 ppm for all process temperatures, the BACT requirement for all new equipment is 30 ppm for all process categories. Rule 1147 was amended in 2017 to reflect findings from the February 2017 Final Technology Assessment that was reviewed by ETS Inc. BACT revisions from February 2019 revised the BACT guidance from this category to 30 ppm. As a result of the difference in BACT and Rule 1147 limits, new units permitted after 2019 are limited to 30 ppm while older equipment permitted between 2017 to 2019 is assigned the permit limit of 60 ppm.

Source Tests

Facility-submitted source test results from 80 units were analyzed to assess NOx concentration levels being achieved. From the evaluated source tests, 13 source test results were obtained from RECLAIM units and 67 source test results were obtained from non-RECLAIM units. Source test results ranged from <1 ppm to 126 ppm. Seven of the 13 units source tested in RECLAIM demonstrated source tested emissions of below 20 ppm while 47 of the 67 units in non-RECLAIM demonstrated source tested emissions of below 20 ppm. A summary of the technology assessment findings is shown in Figure 2-2.

Figure 2-2 – Summary of Technology Assessment for Afterburner, Degassing Unit, Remediation Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	60 ppm (30 ppm BACT)	20 ppm	7 of 13 RECLAIM	20 ppm
			47 of 67 Non-RECLAIM	

Remediation Unit

The category for remediation units consists of 486 units in non-RECLAIM and 4 units in RECLAIM. Units in this source category are used to capture or incinerate air toxics, such as volatile organic compounds (VOC) and other combustible vapors, extracted from soil or water. Equipment for this source category consists of units utilizing gas fired sources and other processes not considered NOx sources, such as carbon absorbers and electric oxidizers. Staff analyzed a sample of 48 non-RECLAIM units and all 4 RECLAIM units. Out of the units analyzed, 31 of 48 non-RECLAIM and three out of four RECLAIM sources were not applicable to Rule 1147. From the 18 units analyzed that are applicable to Rule 1147, the total heat input ranged between 0.5 to 6.8 MMBtu/hr. From the 18 Rule 1147 applicable units, 13 units had total heat input ratings below 2 MMBtu/hr.

Permit Limits

Rule 1147 currently limits remediation units to a NOx emission limit of 60 ppm corrected to 3% O₂; however, remediation units manufactured and installed before March 1, 2012, do not need to comply with Rule 1147 limits until after combustion system modification or replacement. Newer units permitted after 2012 are subject to a NOx emission limit of 60 ppm at the time of permitting.

Source Tests

Due to the extended compliance period outlined in Rule 1147, the vast majority of remediation units are not required to comply with Rule 1147 limits until combustion system modification or replacement. Staff was unable to identify source tests for equipment in this source category. Due to the scarcity of source test data for this source category, the staff recommendation is to maintain the existing NOx limit of 60 ppm and to revisit this source category during a future rule amendment.

Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner

The category for burn-off furnace, burnout oven, incinerator or crematory with or without integrated afterburner consists of 314 total units with 303 units located at non-RECLAIM facilities and 13 units located at RECLAIM facilities. The total heat input for equipment found in this category ranges between less than 1 MMBtu/hr to 9 MMBtu/hr. These units may be called burn-off or burn-out ovens, kilns or furnaces and incinerators; however, all units perform and operate in a similar fashion. They are built with a primary chamber for melting, vaporizing or pyrolyzing some material on a part or piece of equipment to recycle the material or component. Some units are used for incinerating material that cannot be reclaimed or must be incinerated prior to disposal. The primary chamber leads to an integrated secondary afterburner chamber that destroys particulate matter, carbon monoxide, VOCs and any other organic material that enter this afterburner section. The incinerated material is reduced to carbon dioxide and water vapor.

Permit Limits

Permit limits of existing permitted equipment in this category range between 30 ppm to 102 ppm (equivalent to RECLAIM default emission factor of 130 lb/MMSCF). Equipment permit limits are based on existing and previous Rule 1147 limit of between 30 to 60 ppm for all process temperatures. While current Rule 1147 limit for this category is 60 ppm for all process temperatures, Rule 1147 was amended in 2017 to reflect findings from the February 2017 Final Technology Assessment by increasing emission limits for this category from 30 ppm to 60 ppm. Because of the rule amendment, new units permitted after 2017 are limited to 60 ppm while older equipment are still limited to 30 ppm.

Source Tests

Facility-submitted source test results from 69 units were analyzed to assess NOx concentration levels being achieved. From the evaluated source tests, one source test result was obtained from a RECLAIM unit and 68 source test results were obtained from non-RECLAIM units. Source test results ranged from 4 ppm to 60 ppm. Nine of the 68 units in non-RECLAIM demonstrated source tested emissions of below 30 ppm while no units were identified to have source tested below 30 ppm in RECLAIM. Summary of technology assessment is shown in Figure 2-3.

Figure 2-3 – Summary of Technology Assessment for Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	60 ppm	30 ppm	0 of 1 RECLAIM	30 ppm
			9 of 68 Non-RECLAIM	

Evaporator, Fryer, Heated Process Tank, or Parts Washer

The category for evaporator, fryer, heated process tank, or parts washer consists of 51 total units with 49 units located at non-RECLAIM facilities and 2 units located at RECLAIM facilities. Units in this category are used to heat containers of process fluid for various applications. The total heat input for equipment found in this category range between less than 1 MMBtu/hr to 14 MMBtu/hr. There are different types of heating systems including immersion tube heating in conveyor units and external oil heating systems. While most equipment in this category is equipped with small burners (<2 MMBtu/hr) that would generally be exempt from permitting per Rule 219, the associated process has emissions other than the products of combustion such as VOC, PM or toxic air contaminants which necessitates permitting of the process equipment, including any small burners.

Permit Limits

Permit limits of existing permitted equipment in this category range between 60 ppm to 102 ppm (equivalent to RECLAIM default emission factor of 130 lb/MMSCF). Equipment permit limits are based on existing and previous Rule 1147 limit of 60 ppm for all process temperatures. As part of the July 7, 2017 rule amendment, any evaporator, heated process tank and parts washer with a South Coast AQMD permit prior to January 1, 2014 became exempt from applicable Rule 1147 limits until combustion system modification, relocation or unit replacement.

Source Tests

Facility-submitted source test results from 8 units were analyzed to assess NOx concentration levels being achieved. From the evaluated source tests, all 8 source test results were obtained from non-RECLAIM units. Source test results ranged from 37 ppm to 56 ppm. Summary of technology assessment is shown in Figure 2-4.

Figure 2-4 – Summary of Technology Assessment for Evaporator, Fryer, Heated Process Tank, or Parts Washer

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	60 ppm	60 ppm	No Source Test from RECLAIM Sources	60 ppm
			8 of 8 Non-RECLAIM	

Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank

The category for oven, dehydrator dryer, heater, kiln, calciner, cooler, roaster, furnace, or heated storage tank is the largest equipment category found in the Rule 1147 universe consisting of approximately 1,509 pieces of non-RECLAIM equipment and 191 pieces of RECLAIM equipment. The total heat input for equipment found in this category ranges between less than 1 MMBtu/hr to 30 MMBtu/hr. Due to the large number of equipment subject to this equipment category, staff sampled a subset of 728 units consisting of 177 units in RECLAIM and 552 units in non-RECLAIM. The statistically significant subset of equipment was chosen by random to address potential bias in the evaluation criteria.

Permit Limits

Permit limits of existing permitted equipment in this category range between 30 ppm to 101.4 ppm (equivalent to RECLAIM default emission factor of 130 lb/MMSCF). Equipment permit limits are based on existing Rule 1147 limits and divided into either 30 ppm or 60 ppm depending on process temperature. Equipment with a process temperature of less than 1,200°F are required to meet 30 ppm NOx while those with process temperature greater than or equal to 1,200°F are required to meet 60 ppm NOx.

Source Tests

Facility-submitted source test results from the subset of 728 units were analyzed to assess NOx concentration levels being achieved. From the selected subset, 201 source test results were obtained from 28 RECLAIM units and 173 non-RECLAIM units.

For units with process temperatures less than 1,200°F, source test results from 169 non-RECLAIM units and 27 RECLAIM units were identified to range from 5 to 64 ppm. Out of the source test results from 196 units surveyed, 87 units demonstrated emissions below 20 ppm NOx with 76 units belonging to non-RECLAIM facilities and 11 units belonging to RECLAIM facilities.

For units with process temperatures greater than or equal to 1,200°F, source test results from 4 non-RECLAIM units and one RECLAIM unit were identified ranged from 18 to 59 ppm. Out of the five identified source tests, three units demonstrated result below 30 ppm NOx with all three units belonging to non-RECLAIM facilities. Summary of technology assessment is shown in Figure 2-5.

Figure 2-5 – Summary of Technology Assessment for Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
<1,200° F	30 ppm	20 ppm	11 of 27 RECLAIM	20 ppm
			76 of 169 Non-RECLAIM	
≥1,200° F	60 ppm	30 ppm	0 of 1 RECLAIM	30 ppm
			3 of 4 Non-RECLAIM	

Tenter Frame or Fabric or Carpet Dryer

The category for tenter frame or fabric or carpet dryer consists of 61 total units with 35 units located at non-RECLAIM facilities and 26 units located at RECLAIM facilities. Units in this category are used to hold and dry fabric in a way as to avoid shrinkage. Burners for equipment in this category range between less than 1 MMBtu/hr to 10 MMBtu/hr. Process temperatures are always less than 800°F.

Permit Limits

Permit limits of existing permitted equipment in this category range between 30 ppm to 101.4 ppm (equivalent to RECLAIM default emission factor of 130 lb/MMSCF). Equipment originally permitted after Rule 1147 adoption on December 8, 2008 is assigned permit limits based on existing Rule 1147 limits of 30 ppm. Equipment originally permitted before Rule 1147 adoption are limited to permit limits of between 40 to 60 ppm.

Source Tests

Facility-submitted source test results from 29 units were analyzed to assess NOx concentration levels being achieved. From the evaluated source tests, 20 source test results were obtained from non-RECLAIM units and 9 source test results were obtained from RECLAIM units. Source test results ranged from 18 ppm to 60 ppm. One of 20 units from non-RECLAIM demonstrated source test result of under 20 ppm and no units in RECLAIM demonstrated source test results below 20 ppm. Sixteen of the 20 units source tested in non-RECLAIM demonstrated source tested emissions of below 30 ppm while four of the 9 units in RECLAIM demonstrated source tested emissions of below 30 ppm. Summary of technology assessment is shown in Figure 2-6.

Figure 2-6 – Summary of Technology Assessment for Tenter Frame or Fabric or Carpet Dryer

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	30 ppm	20 ppm	0 of 9 RECLAIM	20 ppm
			1 of 20 Non-RECLAIM	

Autoclave

The category for autoclave is a new equipment category in PAR 1147 and consists of 10 total units with all identified units located at RECLAIM facilities. Prior to PAR 1147, autoclaves were categorized in the Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank category. From stakeholder feedback and further assessment, staff proposes to move autoclaves into a separate equipment category due to the unique heating process and pressurized vessel used. Identified units in this category are pressurized vessels heated by natural gas fired burners used to slowly heat and cure composite materials used in the aerospace industry. Burners for equipment in this category range between 5 MMBtu/hr to 25 MMBtu/hr. Process temperatures are generally less than 800°F.

Permit Limits

Permit limits of existing permitted equipment in this category range between 30 ppm to 101.4 ppm (equivalent to RECLAIM default emission factor of 130 lb/MMSCF). Equipment permit limits are based on existing Rule 1147 limits and divided into either 30 ppm or 60 ppm depending on process temperature. Equipment with process temperature of less than 1,200°F are required to meet 30 ppm NOx while those with process temperature greater than or equal to 1,200°F are required to meet 60 ppm NOx.

Source Tests

Facility-submitted source test results from 2 RECLAIM units were analyzed to assess NOx concentration levels being achieved. Source test results for both units demonstrated source test results below 30 ppm. Summary of technology assessment is shown in Figure 2-7.

Figure 2-7 – Summary of Technology Assessment for Autoclave

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	30 ppm	30 ppm	2 of 2 RECLAIM	30 ppm
			No Source Test from Non-RECLAIM	

Tunnel Kiln and Tunnel Dryer

The category for tunnel kiln and tunnel dryer is a new equipment category in PAR 1147 and consists of 6 total units with five identified units located in RECLAIM and one identified unit in non-RECLAIM. Prior to PAR 1147, tunnel dryers were categorized in the Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank category. From stakeholder feedback and further assessment, staff proposes to move tunnel dryers into a separate equipment category due to the unique heating process. Tunnel dryers are used to physically evaporate moisture from a material using heated air. Typically, tunnel dryers operate at temperatures less than 1,200°F while tunnel kilns operate at temperatures greater than 1,200°F. Exhaust gases from both tunnel kilns and tunnel dryers exhibit high moisture contents (approximately 30 percent or more) and relatively low temperatures (less than 400 °F). Additionally, because the combustion gases and the heated process air are combined before discharge, the final exhaust gas has a higher exhaust oxygen concentration. Units in this equipment category consist of multiple burners with total heat input of between 14 MMBtu/hr to 84 MMBtu/hr.

Permit Limits

Permit limits of existing permitted equipment in this category range between 60 ppm to 101.4 ppm (equivalent to RECLAIM default emission factor of 130 lb/MMSCF). Staff identified one major source tunnel dryer operated at a RECLAIM facility with no permit limit and monitored by a continuous emissions monitoring system (CEMS). Equipment permit limits for tunnel kilns are based on existing Rule 1147 limits of 60 ppm due to high process temperature greater than or equal to 1,200°F.

Source Tests

From the evaluated source tests, source test results were obtained from all six identified units in non-RECLAIM and RECLAIM. Source test results ranged from 20 ppm to 54 ppm. The tunnel dryer major source identified to not have an assigned permit limit in RECLAIM demonstrated source test result demonstrating below 30 ppm NOx. Source test results for four other identified RECLAIM tunnel kilns demonstrated source test results of between 40 ppm to 52 ppm NOx. One tunnel kiln identified in non-RECLAIM demonstrated source test result of 54 ppm NOx. Summary of technology assessment is shown in Figure 2-8.

Figure 2-8 – Summary of Technology Assessment for Tunnel Dryers

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
<1,200° F	30 ppm	30 ppm	1 of 1 RECLAIM	30 ppm
			No Source Test in Non-RECLAIM	
≥1,200° F	60 ppm	60 ppm	No Source Test in RECLAIM	60 ppm
			5 of 5 Non-RECLAIM	

Natural Gas Fired Chillers

The category for natural gas fired chillers is a new equipment category in PAR 1147 and consists of 12 total units with three units located at RECLAIM facilities and nine units located at non-RECLAIM facilities. Prior to PAR 1147, chillers were categorized in the Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank category. From stakeholder feedback and further assessment, staff proposes to move chillers into a separate equipment category due to the unique heating process and ability to reach lower NOx emissions levels due to the process. Burners for equipment in this category range between 2 MMBtu/hr to 13 MMBtu/hr. Process temperatures are generally less than 800°F.

Permit Limits

Permit limits of existing permitted equipment in this category are all currently at 20 ppm compared to the rule limit requirement of 30 ppm. Newly permitted natural gas fired chillers are also permitted to the BACT limit of 20 ppm.

Source Test

Facility-submitted source test results from all 12 identified units were analyzed to assess NOx concentration levels being achieved. Source test results for all units demonstrated source test results below 20 ppm. Summary of technology assessment is shown in Figure 2-9.

Figure 2-9 – Summary of Technology Assessment for Natural Gas Fired Chillers

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	30 ppm	20 ppm	3 of 3 RECLAIM	20 ppm
			9 of 9 Non-RECLAIM	

Turbine <0.3 MW (Natural Gas)

The category for natural gas turbines <0.3 MW is a new equipment category in PAR 1147 that impacts natural gas fired turbines smaller than 0.3 MW that are not subject to South Coast AQMD Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines. Natural gas turbines of this size are generally exempt per South Coast AQMD Rule 219 if the units are certified to meet emission levels certified by the California Air Resources Board. For units operating outside their certified configurations, a South Coast AQMD permit is required. For RECLAIM facilities operating these units under a South Coat AQMD permit to exit RECLAIM, a landing rule and BARCT limit must be established. This new equipment category consists of 29 units with 15 units located in non-RECLAIM facilities and 14 units in RECLAIM facilities.

Permit Limits

Permit limits of existing permitted equipment in this category range between 9 ppm to 25 ppm. Equipment permit limits are based on BACT at the time of permitting. New equipment within this category is permitted to a limit of 9 ppm. NOx emissions are corrected to 15% oxygen in turbines in contrast to 3% oxygen for other Rule 1147 equipment categories, due to the internal combustion employed.

Source Tests

Facility-submitted source test results from 17 units were analyzed to assess NOx concentration levels being achieved. Out of the 17 source tested units, 11 units are located at non-RECLAIM facilities and six units are located at RECLAIM facilities. Source test results for all units demonstrated below 9 ppm, including three units with existing permit limits of 25 ppm. Summary of technology assessment is shown in Figure 2-10.

Figure 2-10 – Summary of Technology Assessment for Natural-Gas-Fired Turbines

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	9 ppm	9 ppm	6 of 6 RECLAIM	9 ppm
			11 of 11 Non-RECLAIM	

Turbine <0.3 MW (Distillate)

The category for distillate turbines <0.3 MW is a new equipment category in PAR 1147 that impacts distillate fuel fired turbines smaller than 0.3 MW that are not subject to South Coast AQMD Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines. Natural gas turbines of this size are generally exempt per South Coast AQMD Rule 219 if the units are certified to meet emission levels certified by the California Air Resources Board. For units operating outside their certified configurations, a South Coast AQMD permit is required. For RECLAIM facilities operating these units under a South Coast AQMD permit to exit RECLAIM, a landing rule and BARCT must be established. This new equipment category consists of 3 units located at one RECLAIM facility.

Permit Limits

All three units subject to this equipment category are assigned the permit limit of 77 ppm. Equipment permit limits are based on BACT at the time of permitting. NOx emissions are corrected to 15% oxygen in turbines compared to 3% oxygen in other Rule 1147 equipment categories, due to the internal combustion employed.

Source Test

Facility-submitted source test results from all three units were analyzed to assess NOx concentration levels being achieved. Source test results for all units demonstrated below 77 ppm. Summary of technology assessment is shown in Figure 2-11.

Figure 2-11 – Summary of Technology Assessment for Distillate Fuel Fired Turbines

Operating Temp	South Coast AQMD Limit	Existing Units		Technology Assessment
		ST Recommended Limit	Units Meeting Recommendation	
All	77 ppm	77 ppm	3 of 3 RECLAIM	77 ppm
			No Source Test Non-RECLAIM	

Rotary Dryer

On August 6, 2021, the South Coast AQMD Governing Board adopted Rule 1147.1 – NOx Reductions from Aggregate Dryers which bifurcated aggregate dryers, including rotary aggregate dryers, from Rule 1147. During rulemaking for Rule 1147.1, a technology assessment² was conducted for aggregate dryers, including rotary aggregate dryers. This assessment resulted in the Rule 1147.1 limit recommendation of 30 ppmv NOx and 1,000 ppmv CO both corrected to 3% O2 considering past performance and compliance margin. Based on stakeholder input, staff has identified at least one rotary dryer used in drying applications for metal chips. The identified application of rotary dryer in this non-aggregate drying operation is similar to the rotary dryers identified in Rule 1147.1 rulemaking. On this basis, the emission limit recommendation of rotary dryers subject to PAR 1147 is the same as that of Rule 1147.1.

Permit Limits and Source Test

One non-aggregate rotary dryer was identified as a large RECLAIM source with a NOx concentration limit of 38 ppmv corrected to 3% O2. Source test was performed for the identified equipment, and the results demonstrated NOx emissions of less than 30 ppmv NOx.

Other Regulatory Requirements

Analysis of NOx Concentration Limits for Proposed Rule 1147 Equipment at Other Air Districts

Staff reviewed other air districts’ requirements for Proposed Amended Rule 1147 applicable equipment to identify rules and regulations with lower emission limits or limits representing improvements in pollution control technologies. A comparison of the existing requirements in Rule 1147 was made with the analogous rules adopted by two other air districts in California, one in San Joaquin Valley (SJVAPCD) and the other in Ventura.

SJVAPCD Rule 4309

SJVAPCD Rule 4309 (Dryers, Dehydrators, and Ovens) regulates equipment that are greater than or equal to 5 MMBtu/hr with full compliance by December 1, 2009. Rule 4309 limits applicable gaseous fueled equipment to a NOx limit of between 3.5 to 5.3 ppm and a CO limit of 42 ppm both corrected to 19% oxygen which are between 32 to 50 ppm NOx and 395 ppm CO corrected to 3% oxygen. SJVAPCD Rule 4309 does not separate emission limits based on process temperature, so comparable NOx emission limits may be more or less stringent compared to existing South Coast AQMD Rule 1147 depending on the process and temperature. However

² August 6, 2021 South Coast AQMD Governing Board Meeting Agenda Item 28 – Determine That Proposed Rule 1147.1 – NOx Reductions from Aggregate Dryers, Is Exempt from CEQA and Adopt Rule 1147.1: <http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-Aug6-028.pdf?sfvrsn=6>

South Coast AQMD Rule 1147 does not contain any requirements for CO which makes SJVAPCD Rule 4309 more stringent with regard to CO.

Monitoring requirements of Rule 4309 include monthly emissions monitoring or installation of CEMS with source testing required every 24 months. SJVAPCD has more stringent MRR requirements when compared to existing South Coast AQMD Rule 1147. Rule 4309 requires source testing at the frequency of every 24 months and periodic emissions monitoring every month as compared to the Rule 1147 requirement of one source test at the time of compliance determination with no additional requirements for periodic emissions monitoring.

Ventura County Air Pollution Control District (VCAPCD) Rule 74.34

VCAPCD Rule 74.34 –NO_x Reductions from Miscellaneous Sources establishes a NO_x emission limit of between 30 to 80 ppm and CO limit of 400 ppm both corrected to 3% oxygen for any natural gas fired combustion unit where the unit total heat input is greater than or equal to 5 MMBtu/hr. Similar to South Coast AQMD Rule 1147, VCAPCD Rule 74.34 separates emission limits for oven, dryer, heater, incinerator, furnaces and duct burners depending on process temperature of either above or below 1,200°F. oven, dryer, heater, incinerator, furnaces and duct burners operating below 1,200°F are limited to 30 ppm NO_x while those operating above or equal to 1,200°F are limited to 60 ppm NO_x. VCAPCD also contains separate limits for kilns of 80 ppm as well as separate limits for paper product manufacturing and aggregate processes limited to 40 ppm NO_x with a CO limit of 400 ppm across all applicable equipment. VCAPCD Rule 74.34 NO_x limits are generally equivalent to existing Rule 1147 requirements except for the Kiln category which is less stringent than Rule 1147. VCAPCD Rule 74.34 is more stringent for CO for all equipment categories.

Monitoring requirements of Rule 74.34 includes a NO_x and CO source test every 48 months with annual screening of NO_x and CO within 30 days of the anniversary date of the previous source test. VCAPCD Rule 74.34 has more stringent MRR requirements when compared to South Coast AQMD Rule 1147. Rule 74.34 requires source testing at the frequency of every 48 months and annual screening of NO_x and CO within 30 days of the anniversary date of the previous source test when compared to the Rule 1147 requirement of one source test at the time of compliance determination with no requirements for periodic emissions monitoring.

Assessment of Pollution Control Technologies

Ultra-Low/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, 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 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 enough for the demands of the operation.

Selective Catalytic Reduction (SCR) Systems

SCR is a post-combustion control technology that is a commercially available and commonly employed to control NO_x emissions from wide range of NO_x sources. It is considered to be BARCT, if cost-effective, for controlling NO_x emissions from existing combustion sources. 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 5 ppm when the catalyst is fresh and 20 ppm at the end of the catalyst life. However, newly permitted SCR systems have an ammonia slip limit of 5 ppm. 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.

For applications where exhaust temperatures are below the minimum reaction temperature, additional heat in the form of duct burners would need to be installed for proper emission reduction. Doing so would increase mass emissions at the inlet of the SCR and lower total emissions reduction potential of the SCR system.

Vendor Discussions

The following four vendors and manufacturers (in alphabetical order) were contacted requesting information regarding ultra-low/low NO_x burners and SCR systems. All four provided technical input and provided cost estimates that has been included in the discussion below and the cost-effectiveness analysis in this staff report.

- Fives North American
- Honeywell Thermal Solutions

- Nationwide Boiler Incorporated
- Tri-Mer Corporation

Ultra-Low/Low NOx Burners Systems

The current NOx limit for categories for Rule 1147, is between 30 to 60 ppm corrected to 3% O₂. Based on the information obtained through vendor discussions, lower NOx emissions with ultra-low/Low NOx burners are feasible for burner replacements and new installations. Based on discussions with one burner manufacturer, achieving 20 ppm NOx ultra-low NOx burner without SCR is feasible in certain applications. Observed source test data also suggests existing equipment and burner technology can feasibly achieve between 20 to 30 ppm NOx and 1,000 ppm CO in existing applications.

Selective Catalytic Reduction (SCR) Systems

Existing Rule 1147 NOx limits can be feasibly achieved with burner only control technologies. The NOx limit for new SCR applications within the South Coast AQMD is 5 ppm with accompanying requirement for 5 ppm ammonia slip. SCR systems are scalable and generally utilized for units greater than 10 MMBtu/hr. From discussions with SCR vendors, system installations PAR 1147 is feasible with some limitations. One limitation for SCR applications in PAR 1147 applicable equipment is the low exhaust temperature for aggregate drying operations. Due to SCR systems requiring minimum exhaust temperatures of about 500 Degrees F, many applications subject to PAR 1147 would require installations of additional heat input devices such as duct burners to meet a minimum exhaust temperature for proper emission reduction reaction to occur. Installation of duct burners would increase NOx emissions at the inlet of the SCR and decrease total reduction potential of the system. Vendor quotes also indicated that inclusion of duct burners would also increase the overall cost of the control system.

Initial BARCT Recommendations and Additional Considerations

Based on the review of the types of pollution control technologies available to reduce NOx and CO emissions for equipment subject to PAR 1147, burner control technologies are still the main technologies that can achieve the NOx concentration limits specified in these rules.³

Natural gas fired units comprise most of the equipment subject to PAR 1147; however, certain equipment uses liquid fuels such as existing distillate fueled turbines. Summary of initial staff recommendations based on feasibility is shown in Table 2-1.

³ Modifications with calculated increases of one pound or more NOx would be subject to BACT

Table 2-1 -Initial BARCT Recommendations for Proposed Amended Rule 1147

Equipment Category	Operating Temperature	Current Rule Limit	Proposed NOx Limit ¹	Proposed CO Limit ¹
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	30 ppm	20 ppmv (0.024 lb/mmBtu)	1,000 ppmv
	≥1,200°F	60 ppm	30 ppmv (0.036 lb/mmBtu)	
Tunnel Dryers	<1,200°F	30 ppm	30 ppmv (0.036 lb/mmBtu)	
	≥1,200°F	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	60 ppm	20 ppmv (0.024 lb/mmBtu)	
Remediation Unit	All	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Evaporator, Fryer, Heated Process Tank, and Parts Washer	All	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Burn-off Furnace, Burnout Oven, Incinerator, Crematory with or without Integrated Afterburner	All	60 ppm	30 ppmv (0.036 lb/mmBtu)	
Tenter Frame, Fabric or Carpet Dryer	All	30 ppm	20 ppmv (0.024 lb/mmBtu)	
Other Unit and Process Temperature	<1,200°F	30 ppm	30 ppmv (0.036 lb/mmBtu)	
	≥1,200°F	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Chillers	All	30 ppm	20 ppmv (0.024 lb/mmBtu)	
Micro-Turbines ² (All Other)	All	N/A	9 ppmv (0.011 lb/mmBtu)	
Micro-Turbines ² (In-Use Distillate Fuel)	All	40 ppm	77 ppmv (0.094 lb/mmBtu)	
Rotary Dryers	All	30 ppm	30 ppmv (0.036 lb/mmBtu)	
Auto-Claves	All	30 ppm	30 ppmv (0.036 lb/mmBtu)	
All Liquid Fuel-Fired Units	<1,200°F	40 ppm	40 ppmv (0.053 lb/mmBtu)	
	≥1,200°F	60 ppm	60 ppmv (0.073 lb/mmBtu)	

¹ Emissions limits are corrected to 3% O₂, unless otherwise specified

² Emissions limits are corrected to 15% O₂

Cost-Effectiveness and Incremental Cost-Effectiveness Analysis

Cost-Effectiveness Methodologies

The South Coast AQMD routinely conducts cost-effective analyses regarding proposed rules and regulations that result in the reduction of criteria pollutants (NO_x, SO_x, VOC, PM, and CO). The analysis is used as a measure of relative effectiveness of a proposal. It is generally used to compare and rank rules, control measures, or alternative means of emissions control relating to the cost of purchasing, installing, and operating control equipment to achieve the projected emission reductions. The major inputs in a cost-effectiveness analysis include capital and installation costs, operating and maintenance costs, emission reductions, discount rate, and equipment life. There are two potential methods to calculate cost-effectiveness for emission reductions, discounted cash flow method and levelized cash flow method. The cost-effectiveness calculations were completed using the discounted cash flow method based on the discussions and comparisons of the two methods below.

Discounted Cash Flow (DCF)

The DCF method converts all costs, including initial capital investments and costs expected in the present and all future years of equipment life, to a present value. Conceptually, it is as if calculating

the amount of funds that would be needed at the beginning of the initial year to finance the initial capital investments and to set aside to pay off the annual costs as they occur in the future. The fund that is set aside is assumed to be invested and generates a rate of return at the discount rate chosen. The final cost-effectiveness measure is derived by dividing the present value of total costs by the total emissions reduced over the equipment life. Below is the equation used for calculating cost-effectiveness with DCF as was presented in the 2016 AQMP Socioeconomic Report Appendix 2-B (p. 2-B-3):

$$\text{Cost} - \text{effectiveness} = \frac{\text{Initial Capital Investments} + (\text{Annual O\&M Costs} \times \text{PVF})}{\text{Annual Emission Reductions} \times \text{Years of Equipment Life}}$$

Where:

$$\text{PVF} = \frac{(1 + r)^N - 1}{r * (1 + r)^N}$$

Where r = real interest rate (discount rate); and N = years of equipment life.

The present-value factor (PVF) converts a constant stream of payments made for N years into its single present-value equivalent.

Levelized Cash Flow (LCF)

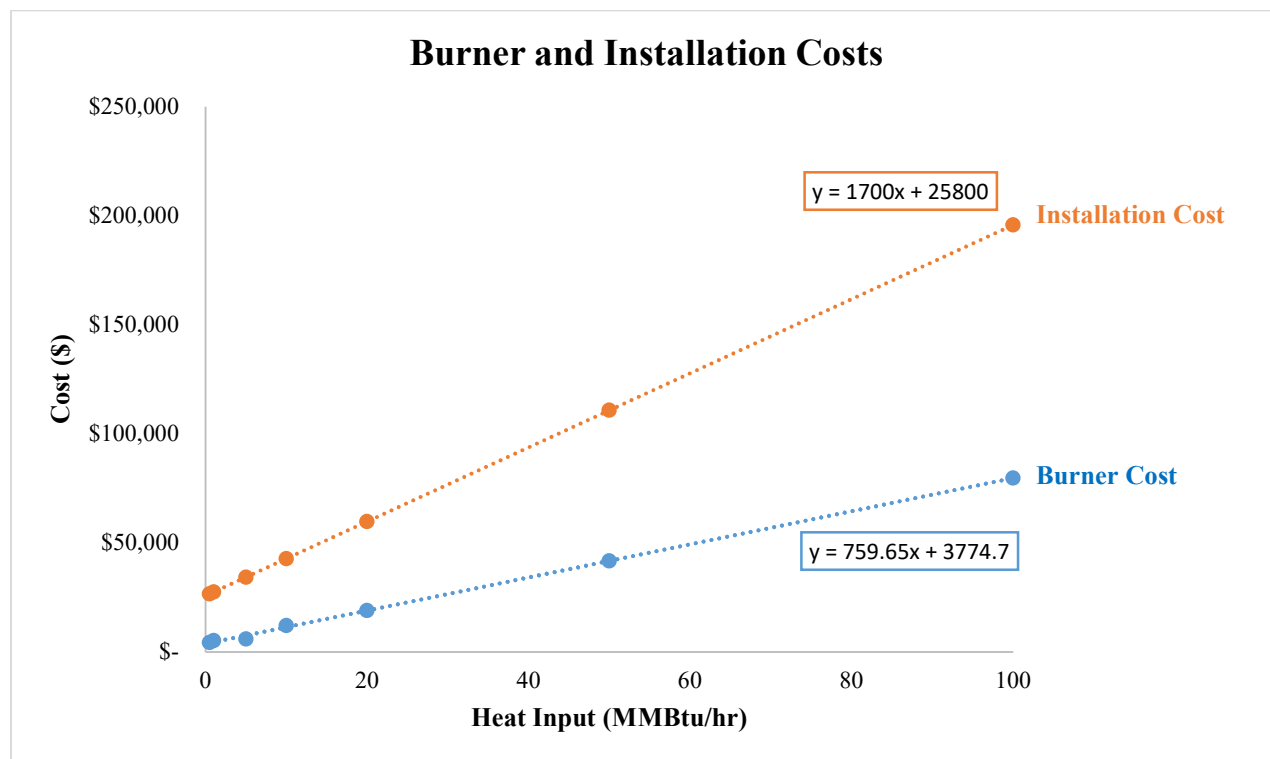
The LCF method annualizes the present value of total costs as if all costs, including the initial capital investments, would be paid off in the future with an equal annual installment over the equipment life. What is less clear, however, is how to deal with non-constant emission reductions when using the LCF method. The LCF method is designed to compare the annualized cost with the annual emission reduction that can be potentially achieved by a project; thus implicitly, emission reductions are constant when the LCF method is applied.

$$\text{LCF} = \left(\frac{\text{Annualized Present Value of Total Costs}}{\text{Average Annual Emission Reductions}} \right)$$

Summary of Cost-Effectiveness and Incremental Cost-Effectiveness Analysis

To assess the cost-effectiveness for the proposed BARCT limits, cost information about the control equipment was obtained from discussions with manufacturers, vendors, and stakeholders. Additional references were made to the installation cost information obtained during the 2018 rulemaking for the Rule 1146 series. Cost extrapolations were further compared to stakeholder provided vendor quotations which showed staff's estimates were generally more conservative than that of stakeholder quotations. Figure 2-12 shows the linear correlations between equipment and installation cost for natural gas fired units based on size (MMBtu/hr) for burner replacements.

Figure 2-12 – Capital Costs for Equipment and Installation



Burner costs depended on the equipment size. The budget prices obtained for burner retrofits, which indicate 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 equipment burners. Staff utilized a bottom-up approach which evaluated each equipment subject to PAR 1147 and conducted cost-effectiveness analysis on a per equipment basis. Baseline emissions for each equipment were calculated using latest usage information from facility Annual Emissions Reporting (AER), if available. For equipment without AER information, staff used an operating capacity assumption of 80% based off the average industrial production and capacity utilization released by the United States Federal Reserve printed on February 7, 2011⁴. 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 301 – Permitting and Associated Fees* were used to estimate the permitting cost. Table 2-2 shows average cost-effectiveness for each equipment category subject to PAR 1147. In general, all average cost effectiveness for each equipment category is calculated to be below \$50,000/ton with some categories identified to have a cost effectiveness of “no additional cost” or \$0/ton due to BARCT matching existing limits for those equipment categories such as chillers, turbines, and autoclaves.

⁴Federal Reserve Statistical Release G.17, Industrial Production and Capacity Utilization http://www.federalreserve.gov/releases/g17/cap_notes.htm as printed on February 7, 2011.

Table 2-2 –Cost Effectiveness Estimate for PAR 1147 Categories

Equipment Category	Operating Temperature	Average Cost-Effectiveness
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	\$12,700/Ton
	≥1,200°F	\$5,600/Ton
Tunnel Dryers	<1,200°F	\$49,200/Ton
	≥1,200°F	No Additional Cost
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	\$12,300/Ton
Remediation Unit	All	No Additional Cost
Evaporator, Fryer, Heated Process Tank, and Parts Washer	All	\$31,300/Ton
Burn-off Furnace, Burnout Oven, Incinerator, Crematory with or without Integrated Afterburner	All	\$25,800/Ton
Tenter Frame, Fabric or Carpet Dryer	All	\$23,600/Ton
Other Unit and Process Temperature	<1,200°F	No Additional Cost
	≥1,200°F	
Chillers	All	No Additional Costs
Micro-Turbines (All Other)	All	No Additional Costs
Micro-Turbines (In-Use Distillate Fuel)	All	No Additional Costs
Rotary Dryers	All	No Additional Costs
Auto-Claves	All	\$49,000
All Liquid Fuel-Fired Units	<1,200°F	No Additional Costs
	≥1,200°F	No Additional Costs

Incremental cost-effectiveness evaluates and compares two or more control options available for emission reductions. For equipment subject to PAR 1147, the two identified pollution control technologies are ultra-low NO_x burners and selective catalytic reduction (SCR) systems. The general size of applicable equipment in PAR 1147 are below 5 MMBtu/hr and SCR applications are more suited for larger applications that are greater than 10 MMBtu/hr. For the larger equipment impacted by PAR 1147, the processes are generally tunnel dryers with low exhaust temperature (between 300°F and 400°F). SCR systems would require additions of external heat sources, such as duct burners, to bring exhaust temperatures up to temperatures where reduction reactions can efficiently occur (~500°F). External combustion sources of SCR applications increase system cost and lower overall emission reduction potential when compared to SCR applications that do not require external heat input. The average cost-effectiveness for SCR systems including duct burners for all PAR 1147 equipment categories were calculated to be >\$50,000/ton. As such post-combustion controls were found to be not cost-effective and incremental cost-effectiveness between combustion control and post-combustion control was not calculated.

Proposed BARCT Emission Limit

Staff evaluated applicable permitted equipment in the RECLAIM and non-RECLAIM universe to assess and develop the proposed NOx BARCT limit for PAR 1147. The proposal outlined in Table 2-3 was developed by considering data collected from vendor discussions as well as the analysis of source test results and cost-effectiveness. Separate compliance schedules will be developed for applicable equipment with South Coast AQMD permits that limit emissions less than or equal to existing limits under Rule 1147 and for equipment without South Coast AQMD permits that limit emissions less than or equal to existing Rule 1147 limits shown in Table 2-4. Permitted equipment with a permit limit of daily NOx emissions below one pound per day will be exempt from the limits of PAR 1147.

Table 2-3 – Summary of Proposed Amended Rule 1147

Equipment Category	Operating Temperature	Current Rule Limit	Proposed NOx Limit ¹	Proposed CO Limit ¹
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	30 ppm	20 ppmv (0.024 lb/mmBtu)	1,000 ppmv
	≥1,200°F	60 ppm	30 ppmv (0.036 lb/mmBtu)	
Tunnel Dryers	<1,200°F	30 ppm	30 ppmv (0.036 lb/mmBtu)	
	≥1,200°F	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	60 ppm	20 ppmv (0.024 lb/mmBtu)	
Remediation Unit	All	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Evaporator, Fryer, Heated Process Tank, and Parts Washer	All	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Burn-off Furnace, Burnout Oven, Incinerator, Crematory with or without Integrated Afterburner	All	60 ppm	30 ppmv (0.036 lb/mmBtu)	
Tenter Frame, Fabric or Carpet Dryer	All	30 ppm	20 ppmv (0.024 lb/mmBtu)	
Other Unit and Process Temperature	<1,200°F	30 ppm	30 ppmv (0.036 lb/mmBtu)	
	≥1,200°F	60 ppm	60 ppmv (0.073 lb/mmBtu)	
Chillers	All	30 ppm	20 ppmv (0.024 lb/mmBtu)	
Micro-Turbines ² (All Other)	All	N/A	9 ppmv (0.011 lb/mmBtu)	
Micro-Turbines ² (In-Use Distillate Fuel)	All	40 ppm	77 ppmv (0.094 lb/mmBtu)	
Rotary Dryers	All	30 ppm	30 ppmv (0.036 lb/mmBtu)	
Auto-Claves	All	30 ppm	30 ppmv (0.036 lb/mmBtu)	
All Liquid Fuel-Fired Units	<1,200°F	40 ppm	40 ppmv (0.053 lb/mmBtu)	
	≥1,200°F	60 ppm	60 ppmv (0.073 lb/mmBtu)	

¹ Emissions limits are corrected to 3% O₂, unless otherwise specified

² Emissions limits are corrected to 15% O₂

Table 2-4 – Summary of Existing Limits in Rule 1147

Equipment Category(ies)	NOx Emission Limit		
	PPM @ 3% O ₂ , dry or Pound/mmBtu heat input		
	Process Temperature		
Gaseous Fuel-Fired Equipment	≤ 800° F	> 800° F and < 1200° F	≥ 1200° F
Asphalt Manufacturing Operation	40 ppm	40 ppm	
Afterburner, Degassing Unit, Remediation Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator ¹	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Evaporator, Fryer, Heated Process Tank, or Parts Washer	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	
Metal Heat Treating, Metal Melting Furnace, Metal Pot, or Tar Pot	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	30 ppm or 0.036 lb/mmBtu	30 ppm or 0.036 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Make-Up Air Heater or other Air Heater located outside of building with temperature controlled zone inside building	30 ppm or 0.036 lb/mmBtu	30 ppm or 0.036 lb/mmBtu	
Tenter Frame or Fabric or Carpet Dryer	30 ppm or 0.036 lb/mmBtu		
Other Unit or Process Temperature	30 ppm or 0.036 lb/mmBtu	30 ppm or 0.036 lb/mmBtu	60 ppm or 0.073 lb/mmBtu
Liquid Fuel-Fired Equipment	≤ 800° F	> 800° F and < 1200° F	≥ 1200° F
All liquid fuel-fired Units	40 ppm or 0.053 lb/mmBtu	40 ppm or 0.053 lb/mmBtu	60 ppm or 0.080 lb/mmBtu

1. Emission limit applies to burners in units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a unit. The emission limit applies solely when burning 100% fuel and not when the burner is incinerating air toxics, VOCs, or other vapors. The unit shall be tested or certified to meet the emission limit while fueled with natural gas.

As facilities transition from RECLAIM into PAR 1147, interim limits would be put in place until required to meet the proposed NOx and CO emission limits. Non-RECLAIM facilities will be subject to limits of existing Rule 1147 limits while RECLAIM facilities without existing permit limits on NOx will be subject to a transitional limit of 102 ppm NOx based on the existing RECLAIM default emission factor of 130 pounds NOx per million standard cubic feet natural gas (lbs/MMSCF). Equipment with emissions exceeding the current applicable Rule 1147 limit would be required to submit permit applications to meet the proposed limits when the burner reaches 12 years of age or by July 1, 2023, whichever is later. Equipment at or below the current Rule 1147 limit is required to meet proposed limits when the burner reaches 32 years of age or July 1, 2023, whichever is later. Applicable equipment must meet proposed limits upon burner replacement.

CHAPTER 3: SUMMARY OF PROPOSALS

Introduction
Proposed Amended Rule 1147

Introduction

The primary objective of PAR 1147 is to update NO_x and CO emission limits that represent BARCT requirements for applicable equipment and to remove the exclusion of RECLAIM facilities. Proposed Amended Rule 1147 also proposes to include periodic monitoring requirements that are currently not included in Rule 1147. Key provisions included in PAR 1147 are discussed below.

Proposed Amended Rule 1147**Rule 1147 Purpose [Subdivision(a)]**

The purpose of this rule is to reduce emissions of nitrogen oxide (NO_x) and limiting carbon monoxide (CO) emissions from gaseous and liquid fuel-fired combustion equipment as defined in this rule.

Rule 1147 Applicability [Subdivision(b)]

PAR 1147 applies to manufacturers, distributors, retailers, installers, owners, and operators of combustion equipment with NO_x emissions that require a South Coast AQMD permit, and when other South Coast AQMD Regulation XI rules are not applicable to the Unit. Equipment that falls under specialized exemption language of an applicable South Coast AQMD Regulation XI rules is not being regulated under PAR 1147.. Equipment with a total heat input of below 325,000 Btu/hr or Units demonstrating less than one pound per day of NO_x as outlined in subdivision (g) of this rule would not be subject to the NO_x and CO emission limit requirements of PAR 1147.

Rule 1147 Definitions [Subdivision(c)]

The following are key definitions for Proposed Amended Rule 1147 to distinguish the new equipment categories for PAR 1147 as well as additional definitions included to guide RECLAIM facilities into PAR 1147. For all definitions, refer to the draft of PAR 1147 released with this staff report.

AUTOCLAVE in paragraph (c)(1), which means:

“a device that uses both heat and pressure (over 15 pounds per square inch) to process materials, employing a heating method that includes an internal heat-transfer coil and an external combustion system which fires gaseous or liquid fuels through the coil.”

CHILLER in paragraph (c)(3), which means:

“any natural gas fired unit that captures and uses waste heat to provide cold water for air conditioning and other process requirements.”

CONTINUOUS EMISSIONS MONITORING SYSTEM in paragraph (c)(7), which means:

“the total combined equipment and systems required to continuously determine air contaminants and diluent gas concentrations and/or mass emission rate of a source effluent (as applicable). The CEMS consists of three major subsystems: sampling interface, analyzer and data acquisition system.”

DECOMMISSION in paragraph (c)(8), which means:

“to permanently shut down a Unit by removing the fuel, air, electricity, or other utility source connected to it and deactivate the Unit’s applicable South Coast AQMD permit.”

FORMER RECLAIM FACILITY in paragraph (c)(10), which means:

“a facility, or any of its successors, that was in the Regional Clean Air Incentives Market program 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.”

MINIMUM OPERATING TEMPERATURE in Paragraph (c)(17), which means:

“the minimum operating temperature specified by the manufacturer, unless otherwise defined in the South Coast AQMD permit.”

NEW UNIT in paragraph (c)(18), which means:

“a Unit that is installed, relocated, or replaced after [Date of Adoption]”

NON-RECLAIM FACILITY in paragraph (c)(19), which means:

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

RECLAIM FACILITY in paragraph (c)(25), which means:

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

SHUTDOWN in paragraph (c)(28), which means:

“as defined in Rule 429 – Startup and Shutdown Exemption Provisions for Oxides of Nitrogen.”

STARTUP in paragraph (c)(29), which means:

“as defined in Rule 429 – Startup and Shutdown Exemption Provisions for Oxides of Nitrogen.”

TUNNEL KILN in paragraph (c)(32), which means:

“any gaseous fired equipment which transfers heat from combusted fuel to air contained in the unit with exhaust moisture content above 30 percent using a continuous moving conveyor or vehicle.”

TURBINE in paragraph (c)(33), which means:

“any gas turbine that is gas and/or liquid fueled with or without power augmentation. This gas turbine is either attached to a foundation at a facility or is portable equipment that will reside at the same facility for more than 12 consecutive months. Two or more gas turbines powering one shaft shall be treated as one gas turbine.”

UNIT in paragraph (c)(34), which means:

“for the purposes of this rule, any combustion equipment with NOx emissions requiring a South Coast AQMD permit and not specifically required to comply with requirements of other South Coast AQMD Regulation XI combustion rules. Basic equipment with integrated control is considered a single Unit.”

For the purposes of PAR 1147, equipment configurations with multiple burners shall be considered a single unit. Total heat input and gas usage for Units with multiple burners shall be the sum of all burners of the Unit.

Rule 1147 Requirements [Subdivision(d)]

Paragraph (d)(1) – Interim Limit for RECLAIM and Non-RECLAIM Facilities

Units at non-RECLAIM facilities are already subject to existing limits or the implementation schedule of existing Rule 1147. As of the date of amendment for PAR 1147, most equipment subject to the rule would have already been required to meet applicable Rule 1147 limits, unless specifically afforded an alternative compliance schedule. PAR 1147 will allow non-RECLAIM facilities to continue to meet compliance limits of existing Rule 1147 until the unit is required to meet the new, lower limits of PAR 1147 in accordance with the implementation schedule in subdivision (e).

As RECLAIM facilities transition out of RECLAIM and to the command-and-control regulatory program, an interim NO_x limit is needed until the facility achieves the proposed NO_x BARCT limit. This is done to ensure that there is an enforceable regulatory requirement that is representative of federal Reasonable Available Control Technology (RACT) levels. In addition, ensure RECLAIM sources with compliance dates after a facility becomes a former RECLAIM facility continue to meet RACT in the interim on an aggregate demonstration basis, units at RECLAIM facilities that do not have an existing NO_x concentration limit on their permit will be subject to a transitional limit of 102 ppmv corrected to 3% oxygen, dry, NO_x which is the equivalent of the RECLAIM default emission factor of 130 lb NO_x/MMSCF natural gas.

Units in existing RECLAIM facilities are categorized as Major, Large, or Process sources. Major sources are monitored with CEMS while large sources have NO_x concentration limits with periodic source testing requirements. Process sources are split between reporting until the RECLAIM default emission factor of 130 lb NO_x/MMSCF without periodic source testing requirements or a NO_x concentration limit with periodic source testing requirements. RECLAIM with existing NO_x limits below 102 ppm that has not yet met BARCT will retain existing limits upon becoming a former RECLAIM facility until required to meet emission limits of Table 1 or Table 2 in PAR 1147 as outlined in paragraphs (d)(2) or (d)(3) depending on the NO_x limit. Units that are subject to a concentration limit above 102 ppmv that has not met BARCT upon becoming a former RECLAIM facility will need to accept a permit limit of 102 ppmv or lower upon becoming a former RECLAIM facility until required to meet emission limits of Table 1 or Table 2 in PAR 1147 as outlined in paragraph (d)(2).

The transitional limit described in this paragraph serves as an enforceable regulatory requirement representative of the federal RACT for RECLAIM facilities once becoming former RECLAIM facilities, and the limits are considered temporary in the scenario that RECLAIM facilities become former RECLAIM facilities prior to meeting BARCT requirements of paragraphs (d)(2) through (d)(6).

Paragraph (d)(2) through (d)(6) – PAR 1147 BARCT Emission Limit

PAR 1147 will establish updated BARCT emission limits for NO_x and CO for applicable equipment as shown in PAR 1147 Table 2 (Table 3-2 of this staff report). An owner or operator of a unit subject to PAR 1147 shall not operate the unit in a manner that exceeds the NO_x and CO limits of PAR 1147 Table 2 unless the unit has an existing permit condition that complies with the NO_x and CO limits of PAR 1147 Table 1 (Table 3-1 of this Staff Report) as of the date of rule amendment. For units without permit conditions that comply with PAR 1147 Table 1 by the date of amendment, the owner or operator may submit a permit application to add a permit condition to the Permit to Operate that requires compliance with the NO_x and CO concentration limits in PAR Table 1 by May 1, 2022.

Paragraph (d)(2) requires units without a permit limit demonstrating compliance with emission limits of PAR 1147 as demonstrated with a source test pursuant to subdivision (h) to follow compliance schedule to meet limits of PAR 1147 Table 2 outlined in paragraph (e)(1). Paragraph

(d)(2) requires units with a permit limit demonstrating compliance with emission limits of PAR 1147 as demonstrated with a source test pursuant to subdivision (h) to follow the extended compliance schedule to meet limits of PAR 1147 Table 2 outlined in paragraph (e)(2).

**Table 3-2 – PAR 1147 Table 1
(NOx Emission Limits for In-Use Units)**

Equipment Categories	Process Temperature	Concentration Limits ¹ (ppmv corrected to 3% O ₂ , dry unless otherwise specified)	
		NOx Limit (ppmv)	CO Limit (ppmv)
Gaseous Fuel-Fired Equipment²			
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	60 ppmv or 0.073 lb/MMBtu	1,000 ppmv
Remediation Unit	All	60 ppmv or 0.073 lb/MMBtu	
Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner	All	60 ppmv or 0.073 lb/ MMBtu	
Evaporator, Fryer, Heated Process Tank, or Parts Washer	All	60 ppmv or 0.073 lb/ MMBtu	
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	30 ppmv or 0.036 lb/ MMBtu	
	≥1,200°F	60 ppmv or 0.073 lb/ MMBtu	
Make-Up Air Heater or other Air Heater located outside of building with temperature controlled zone inside building	All	30 ppmv or 0.036 lb/ MMBtu	
Tenter Frame or Fabric or Carpet Dryer	All	30 ppmv or 0.036 lb/ MMBtu	
Other Unit or Process Temperature	<1,200°F	30 ppmv or 0.036 lb/ MMBtu	
	≥1,200°F	60 ppmv or 0.073 lb/ MMBtu	
Liquid Fuel-Fired Equipment			
Turbine <0.3 MW ³ (In-Use distillate fuel <0.3 MW)	All	77 ppm or 0.094 lb/MMBtu	1,000 ppmv
All liquid fuel-fired Units ³	<1,200°F	40 ppm or 0.053 lb/ MMBtu	
	≥1,200°F	60 ppmv or 0.073 lb/ MMBtu	

1. Concentration limit for Tunnel Kiln(s) equipped with certified NOx CEMS is demonstrated pursuant to paragraph (h)(15), concentration limit for all other Unit(s) is demonstrated pursuant to paragraph (h)(1).
2. Concentration limit applies to burners in Units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a Unit. The concentration limit applies solely when burning 100% gaseous fuel and not when the burner is incinerating air toxics, VOCs, or other vapors. The Unit shall be tested or certified to meet the concentration limit while fueled with natural gas.
3. Concentration Limits in ppmv for Turbines are corrected to 15% O₂, dry basis

**Table 3-2 – PAR 1147 Table 2
(NOx Emission Limit)**

Equipment Categories	Process Temperature	Emission Limits ¹ (ppmv corrected to 3% O ₂ , dry unless otherwise specified)	
		NOx Limit (ppmv)	CO Limit (ppmv)
Gaseous Fuel-Fired Equipment²			
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	20 ppmv or 0.024 lb/MMBtu	1,000 ppmv
Remediation Unit	All	60 ppmv or 0.073 lb/MMBtu	
Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner	All	30 ppmv or 0.036 lb/MMBtu	
Evaporator, Fryer, Heated Process Tank, or Parts Washer	All	60 ppmv or 0.073 lb/MMBtu	
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	20 ppmv or 0.024 lb/MMBtu	
	≥1,200°F	30 ppmv or 0.036 lb/MMBtu	
Make-Up Air Heater or other Air Heater located outside of building with temperature controlled zone inside building	All	30 ppmv or 0.036 lb/MMBtu	
Tenter Frame or Fabric or Carpet Dryer	All	20 ppmv or 0.024 lb/MMBtu	
Autoclave	All	30 ppmv or 0.036 lb/MMBtu	
Tunnel Kiln	<1,200°F	30 ppmv or 0.036 lb/MMBtu	
	≥1,200°F	60 ppmv or 0.073 lb/MMBtu	
Chiller (Absorption or Adsorption)	All	20 ppm or 0.024 lb/MMBtu	
Turbine <0.3 MW ³	All	9 ppm or 0.011 lb/MMBtu	
Rotary Dryer	All	30 ppmv or 0.036 lb/MMBtu	
Other Unit or Process Temperature	<1,200°F	30 ppmv or 0.036 lb/MMBtu	
	≥1,200°F	60 ppmv or 0.073 lb/MMBtu	
Liquid Fuel-Fired Equipment			
All liquid fuel-fired Units ³	<1,200°F	40 ppm or 0.053 lb/MMBtu	1,000 ppmv
	≥1,200°F	60 ppmv or 0.073 lb/MMBtu	

1. Concentration limit for Tunnel Kiln(s) equipped with certified NOx CEMS is demonstrated pursuant to paragraph (h)(15), concentration limit for all other Unit(s) is demonstrated pursuant to paragraph (h)(1).
2. Concentration limit applies to burners in Units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a Unit. The concentration limit applies solely when burning 100% gaseous fuel and not when

the burner is incinerating air toxics, VOCs, or other vapors. The Unit shall be tested or certified to meet the concentration limit while fueled with natural gas.

3. *Concentration Limits in ppmv for Turbines are corrected to 15% O₂, dry basis*

Paragraph (d)(7) and (d)(8) – Emissions of Less Than One Pound Per Day

Paragraph (d)(7) of PAR 1147 will provide an alternative compliance pathway for an owner or operator of a Unit with NO_x emissions of less than one pound per day in lieu of meeting the NO_x and CO emission limits of PAR 1147. The owner or operator must demonstrate that the Unit is emitting less than one pound per day pursuant to subdivision (g) and maintain records pursuant to subdivision (j). An owner or operator of a Unit that is demonstrating compliance with a new or existing permit limit of less than one pound per day may also elect to use this compliance pathway. Units with an existing limit of less than one pound per day are bound to that alternative compliance pathway.

Paragraph (d)(8) provides the pathway into compliance with Rule 1147 for equipment electing to comply with paragraph (d)(7) that fails to continuously demonstrate NO_x emissions of less than one pound per day. An owner or operator that fails to demonstrate less than one pound per day pursuant to paragraph (d)(7) shall submit a permit application to meet the emission limits in PAR 1147 Table 2 within 180 days of failing to demonstrate less than one pound of NO_x emissions per day pursuant to subdivision (g) or failing to satisfy recordkeeping pursuant to subdivision (j). The unit must then comply with the emission limits in Table 2 within 12 months after a permit is issued or upon permit expiration if an extension of time for permit to construct has been approved in writing under *Rule 205 – Expiration of Permits to Construct*.

Paragraph (d)(9) – Fuel Throughput Limit for Distillate Fuel-Fired Turbines

Paragraph (d)(9) requires an owner or operator of a distillate fuel-fired turbine to obtain a permit limit on fuel throughput of less than or equal to 13,800 gallons/year no later than July 1, 2023. This requirement is to retain existing permit limits for the three identified distillate fuel-fired turbines located in RECLAIM to prevent potential backsliding post-RECLAIM.

Paragraph (d)(10) and (d)(11) – Equipment Maintenance and Compliance by Certification

Paragraphs (d)(10) and (d)(11) are existing requirements from Rule 1147. Changes are made to improve clarity in rule language and requirements remain unchanged with PAR 1147.

Rule 1147 Compliance Schedule [Subdivision(e)]

Subdivision (e) provides the compliance schedule for equipment subject to emission limits in subdivision (d).

Paragraph (e)(1), (e)(2), and (e)(3) – Compliance Schedules

Paragraph (e)(1) provides the compliance schedule for units that are required to meet the NO_x and CO emission limits in Table 2 pursuant to paragraph (d)(2). Units subject to this paragraph would need to submit permit applications to demonstrate compliance with emission limits of Table 2 on or before July 1, 2023 or July 1 of the year the unit's burner reaches 12 years of age as determined by subdivision (f), whichever is later.

Paragraph (e)(2) provides the compliance schedule for units that are required to meet the NO_x and CO emission limits in Table 2 pursuant to paragraph (d)(3). Units subject to this paragraph need to submit permit applications to demonstrate compliance with emission limits of Table 2 on or before July 1, 2023 or July 1 of the year the unit's burner reaches 32 years of age as determined by subdivision (f), whichever is later.

The owner and operator of a unit subject to paragraphs (e)(1) and (e)(2) shall not operate the unit that exceeds the NOx and CO emission limits in Table 2 no later than 12 months after a permit is issued or the expiration date of the permit if an extension of time has been approved in writing pursuant to Rule 205.

Paragraph (e)(3) retains the alternative compliance schedules established in Rule 1147 to provide units identified in PAR 1147 Table 3 (Table 3-3 of this Staff Report) the same compliance schedule that was present in Rule 1147. When equipment subject to the compliance schedule in Table 3-3 must comply with PAR 1147 limits, the units must demonstrate compliance with emission limits of PAR 1147 Table 2 (Staff Report Table 3-2).

**Table 3-3 – PAR 1147 Table 3
(Alternative Compliance Schedule)**

Equipment Category(ies)	Permit Application Submittal Deadline	Compliance Deadline
Specific Unit		
Remediation Unit manufactured and installed prior to March 1, 2012 with an active South Coast AQMD permit	Seven months prior to a Combustion System Modification, Combustion System Replacement or Unit Replacement or a Relocation	Upon Combustion System Modification, Combustion System Replacement or Unit Replacement or a Relocation
Evaporator, heated process tank, or parts washer operating prior to January 1, 2014 with an active South Coast AQMD permit	Seven months prior to a Combustion System Modification, Combustion System Replacement or Unit Replacement	Upon Combustion System Modification, Combustion System Replacement or Unit Replacement

Paragraph (e)(4)– Compliance via Decommissioning

Paragraph (e)(4) provides the option for an owner or operator of a unit subject to PAR 1147 to decommission the unit instead of complying with applicable emission limits in PAR 1147 Table 2 provided the unit is decommissioned within 30 months after the applicable application submittal deadline pursuant to subdivision (e) by disconnecting all fuel, air, and electricity to the unit and the unit’s applicable South Coast AQMD permit is inactivated.

Paragraph (e)(5) – Compliance Schedule for Facilities with Five or More Units

Paragraph (e)(6) provides additional time for facilities operating five or more units subject to paragraphs (d)(2) or (d)(3) with a July 1, 2023 permit application submittal date pursuant to paragraphs (e)(1) or (e)(2). The extended schedule is outlined in PAR 1147 Table 4 (Table 3-4 in this Staff Report) and is based on total heat input of all units subject to the multiple unit

implementation schedule as of July 1, 2023. Total heat input does not include units complying with the less than one pound per day option of paragraph (d)(7). The minimum percentages listed are rounded up to the nearest whole number of applicable unit(s). An owner or operator must submit permit application by the dates specified in PAR 1147 Table 4 to comply with emission limits of PAR 1147 Table 2. Owners or operators may elect to decommission units to meet the permit application submittal requirements provided they submit a permit application identifying and declaring the intent to decommission a unit and then decommission it within 30 months after application submittal similar to the requirements of paragraph (e)(4).

**Table 3-4 – PAR 1147 Table 4
(Multiple Unit Implementation Schedule)**

Application Submission Deadline	5 to 9 units (Minimum % of Total Heat Input)	10 to 19 units (Minimum % of Total Heat Input)	20+ units (Minimum % of Total Heat Input)
July 1, 2023	50%		
July 1, 2024	100%	50%	33%
July 1, 2025	Not Applicable		
July 1, 2026		100%	67%
July 1, 2027		Not Applicable	
July 1, 2028			100%

Paragraph (e)(6)– Backstop Provision

Paragraph (e)(6) established a compliance backstop and requires all owners and operators of unit(s) subject to PAR 1147 paragraphs (d)(2) through (d)(8) to comply with the concentration limits of Table 2 by an applicable date. Depending on whichever occurs first, an owner or operator of a unit must demonstrate compliance with PAR 1147 table 2 either 12 months after a permit is issued pursuant to subdivision (e), the expiration date of the permit if extension is approved in writing pursuant to Rule 205, or no later than 30 months following the applicable permit application submittal date in subdivision (e). This backstop provision also applies to owners or operators electing to decommission their equipment pursuant to paragraph (e)(4).

Rule 1147 Burner Age Determination [Subdivision(f)]

Subdivision (f) provides guidance to determine burner age of applicable equipment. Unlike the existing provision in Rule 1147(c)(2), PAR 1147 subdivision (f) does not function as a hierarchy. Owners and operators of unit(s) subject to PAR 1147 may choose any of the available options listed in paragraph (f)(2) to determine burner age, including the invoice related to installation from equipment manufacturer, original manufacturer’s identification plate, information submitted to the South Coast AQMD with permit applications, or any other method of determining burner age that can be substantiated through sufficient written information as approved by the Executive Officer. Paragraph (f)(3) applies to unit(s) without the information outlined in paragraph (f)(2) which will be deemed by operation of PAR 1147 to be 32 years old as of January 1, 2023.

Rule 1147 Demonstration of Less than One Pound of NOx per Day [Subdivision(g)]

Subdivision (g) establishes methods in which an owner or operator can demonstrate NOx emissions of below one pound per day as demonstrated with maximum monthly operating limits.

Two methods are provided to the owner or operator of a unit subject to PAR 1147: monitoring with a unit specific non-resettable totalizing time meter or unit specific non-resettable totalizing fuel meter.

For facilities electing to monitor with a unit specific non-resettable totalizing time meter pursuant to subparagraph (g)(1)(A), options are provided to calculate maximum monthly operating hours with unit specific emission factor in lb NOx/MMSCF natural gas in accordance with equation 1 or operating limits specified in PAR 1147 Table 5 (Table 3-5 in this Staff Report). Facilities may also monitor with a unit specific non-resettable fuel meter pursuant to subparagraph (g)(1)(B) and calculate maximum monthly fuel usage expressed in therms with unit specific emission factor in lb NOx/MMSCF natural gas in accordance with equation 2. An owner or operator of applicable equipment with emissions of less than one pound per day calculating daily maximum usage with equation 1 or equation 2 in PAR 1147 shall determine the emission factor either with a South Coast AQMD approved method (e.g., source test) or use the default unit emission factor of 130 lb/MMSCF natural gas. Equation 1 and Equation 2 are shown in Figure 3-1.

**Table 3-5 – PAR 1147 Table 5
(Less than One Pound per Day Daily Operating Limits)**

Unit Rated Heat Input (Btu/hr)	Monthly Operating Limit (Hours)
< 1,000,000	240
≥ 1,000,000 to < 1,500,000	160
≥ 1,500,000 to ≤ 2,000,000	120

Figure 3-1 – PAR 1147 Equation 1 and Equation 2

<p>Equation #1</p> <p>Monthly Operating Hours = $D \div [R \times (EF \div HHV)]$</p> <p>Where,</p> <ul style="list-style-type: none"> D = Number of Days in Calendar Month R = Rated Heat Input (MMBtu/hr), EF = Emission Factor for the Unit (lbs NOx/MMScf natural gas), HHV = Higher Heating Value of Natural Gas (1,050 MMBtu/MMScf) 	<p>Equation #2</p> <p>Monthly Therms of Fuel = $(D \div EF) \times HHV \times 10$</p> <p>Where,</p> <ul style="list-style-type: none"> D = Number of Days in Calendar Month EF = Emission Factor for the Unit (lbs NOx/MMScf natural gas) HHV = Higher Heating Value of Natural Gas (1,050 MMBtu/MMScf) 10 = Conversion to from MMBtu to Therms
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Rule 1147 Monitoring and Source Testing [Subdivision(h)]

Background of Current MRR Requirements in RECLAIM and Non-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 monitoring, reporting, and recordkeeping (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 four 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 limit (commonly expressed in concentration such as ppmv in Rule 1147) is used for regulatory and compliance demonstration. Unlike RECLAIM equipment, Rule 1147 does not have periodic source testing requirements such as periodic source testing or emissions monitoring, and generally only an initial source test is required.

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 South Coast AQMD approved equivalent monitoring requirement. 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 test audit (RATA), daily emissions electronic reporting, quarterly aggregate electronic reporting, quarterly certifications of emissions reports (QCER), and annual permit emissions program (APEP) report.

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 NO_x 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 is not subject to periodic testing or tuning requirements unless required by permit.

Comparison of MRR Requirements in RECLAIM and Non-RECLAIM

Comparison of MRR requirements between RECLAIM and Rule 1147 are outlined in Table 3-6.

Table 3-6 – Comparison of MRR Requirements Between RECLAIM and Rule 1147

Requirements	RECLAIM	Rule 1147
Source Testing	<p>Major Source: Semi-annual RATA which includes reference source test</p> <p>Super Compliant Major Source: Semi-annual source testing (Every 12 months after 2 years of consecutive passes)</p>	<p>Units Emitting ≥1 Pound NOx/Day: According to schedule found in Rule 1147 Table 2 or at the time of permitting</p>
	<p>Large Source: Source testing every 3 years</p>	<p>Units Emitting <1 Pound NOx/Day: At the time when unit is 35 years old*</p>
	<p>Process Source: Source testing every 5 years</p>	
Periodic Monitoring	<p>Major Source: Requires installation of CEMS or equivalent</p>	<p>Units Emitting ≥1 Pound NOx/Day: Tune up interval according to manufacturer specification</p>
	<p>Super Compliant Major Source: Semi-annual tuning with emissions monitoring</p>	
	<p>Large Source: Semi-annual tuning with emissions monitoring</p>	<p>Units Emitting <1 Pound NOx/Day: Tune up interval according to manufacturer specification and maintaining daily usage records to demonstrate low use</p>
	<p>Process Source: Semi-annual tuning with emissions monitoring</p>	
CEMS Provision	<p>Required for all units meeting definition of major source (≥40 MMBtu/hr and ≥90 billion BTU/year; OR ≥500 MMBtu/hr)</p>	<p>Rule 1147 does not contain provisions for CEMS</p>
Reporting	<p>Major Source: - Daily electronic reporting - Monthly electronic reporting - Quarterly aggregate reporting - Quarterly certifications of emissions report (QCER) - Annual permit emissions program (APEP) report</p>	<p>Rule 1147 does not contain periodic reporting requirements</p>
	<p>Super Compliant Major Source: - Monthly electronic reporting - Quarterly aggregate reporting - QCER - APEP report</p>	
	<p>Large Source: - Monthly electronic reporting - Quarterly aggregate reporting - QCER - APEP report</p>	
	<p>Process Source: - Quarterly aggregate reporting - QCER - APEP report</p>	

*Units subject to Rule 1147 emitting less than 1 pound/day of NOx may continue to operate without complying with rule limits if the facility conducts biennial testing to continuously demonstrate emissions of <1 pound/day.

In general, source testing and reporting requirements under RECLAIM are more stringent than Rule 1147. PAR 1147 aligns MRR requirements for applicable RECLAIM and non-RECLAIM facilities. Title V requires additional periodic monitoring. South Coast AQMD has developed

guidelines, outlined in South Coast AQMD 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. On March 5, 2021, the South Coast AQMD Governing Board voted to amend *Rule 218 - Continuous Emission Monitoring* and adopt *Rule 218.2 - Continuous Emission Monitoring System: General Provisions*, and *Rule 218.3 - Continuous Emission Monitoring System: Performance Specifications* which address the additional MRR requirements as required by the Title V program. Considerations of the different monitoring requirements between RECLAIM and non-RECLAIM are considered when developing MRR requirements for PAR 1147.

Paragraphs (h)(1) through (h)(4) –Source Test Provisions

Units demonstrating compliance with the emission requirements of paragraphs (d)(1), (d)(2), (d)(3), (d)(4), and South Coast AQMD permit limits must conduct a source test to demonstrate compliance with applicable emission limits of Table 1 or Table 2 pursuant to subdivision (d) as well as obtain an approved source test protocol prior to conducting the source test. Source test protocols for subsequent testing would not need to be re-evaluated assuming the tested burner or unit was not altered to require a new permit.

Paragraph (h)(5) –Source Test Methods

Paragraph (h)(5) outlines acceptable methods for determining compliance with PAR 1147 emission limits.

Paragraph (h)(11) through (h)(13)–Periodic Source Testing Requirements

Paragraph (h)(11) outlines the following periodic source test schedule for units subject to PAR 1147 based on rated heat input:

- Below 10 MMBtu/hr – Every 5 calendar years and qualifying periodic source test may not take place earlier than 54 calendar months after previous source test
- Between 10 MMBtu/hr and 40 MMBtu/hr – Every 3 calendar years and qualifying periodic source test may not take place earlier than 30 months after the previous source test
- At or above 40 MMBtu/hr – Every calendar year and qualifying periodic source test may not take place earlier than 6 months after the previous source test

Since Rule 1147 did not previously require periodic source testing for applicable units, paragraph (h)(12) provides applicable units an onramp to the periodic monitoring requirement of PAR 1147. Applicable equipment would need to conduct a source test no later than 24 months after date of rule adoption, which will set the schedule for the next required periodic source test. For units below 40 MMBtu/Hr, owners or operators may choose to use a recent approved source test that shows compliance with applicable PAR 1147 limits as the basis for establishing a recurring schedule. This can in some cases establish a first-required periodic source test that would be more than 24 months after rule adoption.

Equipment that is exempt from Subdivision (d) emission limits outlined in Table 1 and 2 pursuant to subdivision (m) shall conduct periodic source tests in accordance with paragraph (h)(11) through (h)(13) to demonstrate compliance with the applicable emission limits on the equipment's permit.

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

PAR 1147 would not require facilities to install new continuous emissions monitoring systems (CEMS); however, facilities with existing CEMS must maintain the system. Applicable units with installed CEMS would be required to conduct periodic relative accuracy test audits (RATA) as required in Rule 218.2 and 218.3. RATA may substitute for one instance of compliance demonstration required in paragraph (h)(11) as specified in paragraph (h)(13).

Rule 1147 Labeling Requirement [Subdivision(i)]

Subdivision (i) outlines unit labeling requirements including units that have been modified from the original burner configuration.

Rule 1147 Reporting and Recordkeeping [Subdivision(j)]

Subdivision (j) outlines the reporting and recordkeeping requirements including source tests, maintenance, and monthly records for less than one pound per day determination pursuant to subdivision (g). Records must be kept for a minimum of five years and made available to the Executive Officer upon request.

Rule 1147 Certification [Subdivision(k)]

Certification requirements for PAR 1147 is unchanged from existing requirements in Rule 1147.

Rule 1147 Maintenance [Subdivision(l)]

Maintenance requirements for PAR 1147 is unchanged from existing requirements in Rule 1147.

Rule 1147 Exemptions [Subdivision(m)]

Paragraph (m)(3)(H) – Exemption for Solid Fuel-Fired Combustion Equipment

Rule 1147 does not to apply to solid fuels. This transfers the language of non-applicability from the applicability paragraph to be recognized as an exemption.

Paragraph (m)(11) – Start up and Shutdown Exemption for Tunnel Kilns

Paragraph (m)(11) provides a brief period of exemption from NO_x and CO limits of Table 1 and Table 2 during periods of startup and shutdown for tunnel kilns. Startup and shutdown shall be subject to requirements of South Coast AQMD Rule 429.

Paragraph (m)(12) – Exemption for Heating Equipment Associated Fuel Cells

Paragraph (m)(12) provides exemption for heating equipment associated with fuel cells which produce electricity in an electro-chemical reaction and use phosphoric acid, molten carbonate, proton exchange membrane, or solid oxide technologies; and associated heating equipment, provided the heating equipment does not use a combustion source or is fueled exclusively with natural gas, methanol, liquified petroleum gas, or any combination thereof. Heaters with heat input capacity of greater than 2,000,000 btu/hr must also demonstrate supplemental heat used is below 90,000 therms per year. This exemption echoes existing language in South Coast AQMD Rule 219 and provides owners or operators of fuel cells the option to obtain South Coast AQMD permits to satisfy the requirements of the California Air Resources Board Distributed Generation Certification Regulation⁶.

⁶ California Air Resources Board, Distributed Generation Certification Program:
<https://ww2.arb.ca.gov/sites/default/files/2021-11/dg06-final-regulation-unofficial.pdf>

Paragraph (m)(13) – Exemption for Units Not Fired on Natural Gas and/or Liquid Fuel

Paragraph (m)(13) provides an exemption to PAR 1147 Tables 1 and 2 for owners and operators of burners not fired on natural gas and/or liquid fuels during standard operation. Rule 1147 limits were established in 2008 based on natural gas and/or liquid fuel fired burners. Burners fired on landfill, digester, or other process gases were not evaluated for limits in Tables 1 and 2. This exemption would allow equipment permits for burners firing on gases other than natural gas during normal operation to be evaluated for specific emission limits under BACT. Units subject to this exemption shall still continue to conduct source testing in accordance with subdivision (h) to demonstrate compliance with emission limits on unit specific South Coast AQMD permit, and maintain records in accordance to subdivision (j) of PAR 1147. Data obtained from periodic source testing as outlined in subdivision (h) will be evaluated to establish emission limits in future rulemaking.

Paragraph (m)(14) – Exemption for Units used in Equipment that Endothermically Decompose Solid Waste

Paragraph (m)(14) exempts used in equipment that endothermically decompose solid waste in an environment with little to no oxygen. Thermal decomposition processes occurring in low oxygen environments are sealed with no exhaust during normal operation, the process would mean that source testing cannot be feasibly conducted to demonstrate compliance with limits of PAR 1147. Equipment exempt under this paragraph will still be subject to permit specific requirements

CHAPTER 4: IMPACT ASSESSMENT

Introduction

Emission Reductions

Socioeconomic Assessment

California Environmental Quality Act Analysis

Draft Findings Under California Health and Safety Code Section 40727

Comparative Analysis

Introduction

Proposed Amended Rule 1147 (PAR 1147) is expected to impact ~4900 units located at approximately 2,900 facilities. Of the estimated 2,900 facilities, 85 facilities are identified to be participants of the RECLAIM program. Rule 1147 was initially adopted on December 5, 2008 and established NO_x emission limits for applicable equipment located in non-RECLAIM facilities. It is expected that most of the equipment subject to PAR 1147 located at non-RECLAIM facilities is already in compliance with emission limits of PAR 1147 Table 1 (Staff Report Table 3-1) and will be subject to the requirement to submit permit applications and comply with tightened limits when units reach 32 years of age. RECLAIM equipment without permit limits complying with PAR 1147 Table 1 will be subject to meet tightened limits when units reach 12 years of age.

Emissions Reduction

The total NO_x inventory for the RECLAIM and non-RECLAIM units affected by the PAR 1147 is estimated to be 3.69 tons per day. This estimate is taken from South Coast AQMD annual emission report (AER) inventory database for compliance year 2018 for permitted units or audited RECLAIM reported emission data. The South Coast AQMD'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 South Coast AQMD to submit an annual emissions report. Facilities could also be required to submit an AER if the facility receives a notification from South Coast AQMD or is 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 facility's reported emissions for the compliance year of 2020 and fuel usage is calculated using an emission factor represented by the permit limit specific for each unit. For units with missing AER data, emissions were calculated assuming 80% utilization capacity based off the average industrial production and capacity utilization released by the United States Federal Reserve printed on February 7, 2011.⁷

Emission reductions were calculated using the difference between the total aggregate emissions calculated using the concentration limit or emissions factor found on equipment permits (RECLAIM default of 130 lb/MMSCF for those without specified limits or factors) and total aggregate emissions using the PAR 1147 proposed NO_x concentration limit. Emission reductions from facilities expected to submit permit applications by July 1, 2023 are estimated to be 0.54 tpd by July 1, 2026 with expected total reductions of 1.59 tpd by the estimated full implementation date of July 1, 2059.

Socioeconomic Assessment

California Health & Safety Code §40440.8 requires a socioeconomic impact assessment for proposed and amended rules resulting in significant impacts to air quality or emission limitations. This assessment shall include affected industries, range of probable costs, cost effectiveness of control alternatives, and emission reduction potential.

Proposed Amended Rule (PAR) 1147 – NO_x Reductions from Miscellaneous Sources, would reduce emissions of NO_x from miscellaneous combustion equipment (e.g., ovens, kilns, furnaces, dryers, afterburners, fryers, and oxidizers), and is one of several “landing rules” that transitions facilities currently regulated under RECLAIM to a command-and-control regulatory structure. The

⁷Federal Reserve Statistical Release G.17, Industrial Production and Capacity Utilization
http://www.federalreserve.gov/releases/g17/cap_notes.htm as printed on February 7, 2011.

major provisions of PAR 1147 will update NOx emission limits for existing equipment categories, as well as establishing emission limits for new categories (based on stakeholder feedback).

The majority of the emissions limits will take effect at the end of the presumed useful life of equipment currently in use; therefore, the majority of the cost impacts are attributable to the natural turnover of equipment. The equipment meeting current limits shall submit permit applications to meet the proposed emission limits by July 1 of the year after the unit burner becomes 32 years old. Owners or operators of units that are not in compliance with the existing Rule 1147 NOx limits must submit applications to meet proposed emission limits by July 1, 2023, or July 1 of the year after unit burner becomes 12 years old, whichever is later. The compliance deadlines for PAR 1147 were established by taking into consideration equipment size range, application type, the number of units per facility, and whether facilities had multiple pieces of equipment subject to multiple source-specific command-and-control rules.

The total emissions inventory for the PAR 1147 universe is approximately 3.69 tons per day (tpd). Emission reductions from the facilities that are expected to submit permit applications by July 1, 2023, is estimated to be approximately 0.54 tpd by July 1, 2026. Total NOx reductions from the PAR 1147 universe are expected to be approximately 1.59 tpd by the full implementation on July 1, 2059.

Affected Facilities and Industries

The updates and expanded categories subject to the proposed emission limits in PAR 1147 target reductions from miscellaneous combustion equipment affect approximately 5,300 units located at approximately 3,000 facilities. Out of these 3,000 facilities, 68 facilities are expected to incur the majority of additional costs due to PAR 1147 amendments. Out of 68 affected facilities, 44 facilities are located in Los Angeles County, and eight facilities each in Orange County, Riverside County, and San Bernardino County. Fifty one out of the 68 facilities belong to manufacturing sector (North American Industry Classification System or NAICS: 31-33). The remaining facilities may incur minor additional cost impacts, as the replacement of combustion equipment due to natural turnover at the end of its useful life will need to meet PAR 1147 emission limits in order to continue operating. However, the potential future cost differential between PAR 1147 compliant and non-complaint equipment, if any, at the time of replacement is difficult to forecast and quantify.

Compliance Costs

PAR 1147 requirements are expected to result in a one-time total cost of \$22.8 to \$26.0 million, with no additional operating and maintenance (O&M) costs. Installation costs account for nearly half of the total PAR 1147 costs (approximately 48%) with an estimated \$10.9 to \$12.5 million total. One-time permitting costs range from \$4.7 to \$5.3 million. The remaining one-time costs belong to equipment purchase, out of which burner replacements and retrofit account for the largest expense with an estimated cost of \$5.4 to \$6.2 million. The range of dates for required implementation span from 2023 to 2059. Table 4-1 presents the total and annual cost of PAR 1147 by the equipment categories.

Table 4-1: Projected Total and Average Annual Cost of PAR 1147 by the Equipment Categories

Cost Categories	Present Worth Value (2021)		Annual Average (2023-2048)	
	1% Discount Rate	4% Discount Rate	1% Real Interest Rate	4% Real Interest Rate
One-Time Cost				
Administrative Change	\$410,000	\$356,000	\$18,000	\$23,000
Oxidizer	\$254,000	\$203,000	\$12,000	\$14,000
Afterburner	\$345,000	\$273,000	\$16,000	\$20,000
Burner	\$6,160,000	\$5,428,000	\$273,000	\$341,000
Fryer	\$66,000	\$58,000	\$3,000	\$4,000
Heater	\$736,000	\$650,000	\$33,000	\$41,000
Installation	\$12,509,000	\$10,880,000	\$557,000	\$695,000
Permitting	\$5,317,000	\$4,677,000	\$236,000	\$294,000
Tenter Frame	\$265,000	\$229,000	\$12,000	\$15,000
Total	\$26,062,000	\$22,753,000	\$1,159,000	\$1,446,000

Note: Values rounded to nearest thousand dollars. Column total values may not add up due to rounding.

The average annual cost of the proposed amendments is estimated at \$1.2 to \$1.5 million with discount rate factor of 1 and 4 percent, respectively.⁸ The average annual cost per facility is estimated between \$17,000 to \$21,000 per year. Table 4-2 presents the estimated total and average annual cost of PAR 1146 by industry. The major affected sub-industries within manufacturing sector are expected to be Textile Mills and Textile Product Mills (NAICS 313, 314), Aerospace Product and Parts Manufacturing (NAICS 3364), and Printing and Related Support Activities (NAICS 323).

⁸ Assuming 68 facilities incurring PAR 1147 costs.

Table 4-2: Projected Total and Average Annual Cost of PAR 1147 by Industry

Industry Description	NAICS Code	Present Worth Value (2021)		Average Annual Costs (2023-2048)	
		1% Discount Rate	4% Discount Rate	1% Discount Rate	4% Discount Rate
Oil and gas extraction	211	\$11,000	\$6,000	\$1,000	\$1,000
Natural gas distribution	2212	\$52,000	\$35,000	\$2,000	\$3,000
Textile mills and textile product mills	313, 314	\$10,104,000	\$8,515,000	\$449,000	\$560,000
Printing and related support activities	323	\$2,426,000	\$2,050,000	\$108,000	\$134,000
Aerospace product and parts manufacturing	3364	\$4,892,000	\$4,138,000	\$217,000	\$271,000
Other Manufacturing	31-33	\$7,625,000	\$6,342,000	\$341,000	\$424,000
Retail trade	44-45	\$568,000	\$477,000	\$25,000	\$31,000
Scenic and sightseeing transportation and support activities for transportation	487, 488	\$75,000	\$63,000	\$3,000	\$4,000
Wholesale trade	42	\$32,000	\$20,000	\$2,000	\$2,000
Pipeline transportation	486	\$35,000	\$24,000	\$2,000	\$2,000
Automotive repair and maintenance	8111	\$243,000	\$206,000	\$11,000	\$13,000
Total		\$26,062,000	\$22,753,000	\$1,159,000	\$1,446,000

Note: Values rounded to nearest thousand dollars. Column total values may not add up due to rounding.

Macroeconomic Impacts on the Regional Economy

The Regional Economic Model (REMI, PI+ v2.5.0) was used to assess the total socioeconomic impacts of the anticipated policy change (i.e., the proposed amended rule). The model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino, and for each county, it is comprised of five interrelated blocks: (1) output and demand, (2) labor and capital, (3) population and labor force, (4) wages, prices and costs, and (5) market shares.⁹

The assessment herein is performed relative to a baseline (“business as usual”) where the proposed amendments would not be implemented. It is assumed that the affected facilities would finance the capital and installation costs of control equipment, or more specifically, these one-time costs are assumed to be amortized and incurred over the equipment life.

Direct effects of the proposed amendments are used as inputs to the REMI model in order for the model to assess secondary and induced impacts for all the industries in the four-county economy on an annual basis and across a user-defined horizon: 2023 (first year assumed compliance costs) to 2048. Direct effects of the proposed amendments include additional one-time capital and

⁹ Within each county, producers are made up of 156 private non-farm industries and sectors, three government sectors, and a farm sector. Trade flows are captured between sectors as well as across the four counties and the rest of U.S. Market shares of industries are dependent upon their product prices, access to production inputs, and local infrastructure. The demographic/migration component has 160 ages/gender/race/ethnicity cohorts and captures population changes in births, deaths, and migration. (For details, please refer to REMI online documentation at <http://www.remi.com/products/pi>.)

installation costs and additional sales by local vendors of equipment, devices, or services that would meet the proposed requirements.

Whereas all the compliance expenditures that are incurred by the affected facilities would increase their cost of doing business, the purchase of equipment such as new burners, and fryers, and equipment installation would increase the spending and sales of businesses in various sectors, some of which may be located in the South Coast AQMD region.

When the compliance cost is annualized using a 4% real interest rate (\$1.5 million), an average of 41 jobs are projected to be forgone annually from 2023 to 2048. The projected jobs forgone become slightly less (32 jobs annually) when the compliance cost is annualized at a 1% interest rate (\$1.2 million). The 41 jobs forgone represents less than 0.0004% of total annual average jobs (about 11.6 million) in the region. Majority of jobs forgone are expected to occur in the manufacturing sector. Textile mills and textile product mills (NAICS 313 and 314) are projected to experience about 25 percent of the total jobs foregone (10 in total).

California Environmental Quality Act Analysis

Pursuant to the California Environmental Quality Act (CEQA) Guidelines Sections 15002(k) and 15061, the proposed project (PAR 1147) is exempt from CEQA pursuant to CEQA Guidelines Section 15061(b)(3). A Notice of Exemption will be prepared pursuant to CEQA Guidelines Section 15062, and if the proposed project is approved, the Notice of Exemption will be filed for posting with the State Clearinghouse of the Governor's Office of Planning and Research, and with the county clerks of Los Angeles, Orange, Riverside, and San Bernardino counties. In addition, the Notice of Exemption will be electronically posted on the South Coast AQMD's webpage.

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 South Coast AQMD 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

PAR 1147 is needed to establish BARCT requirements for facilities that will be transitioning from RECLAIM to a command-and-control regulatory structure.

Authority

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

Clarity

PAR 1147 is written or displayed so that it's meaning can be easily understood by the persons directly affected by it.

Consistency

PAR 1147 is in harmony with and not in conflict with or contradictory to, existing statutes, court decisions or state or federal regulations.

Non-Duplication

PAR 1147 will not impose the same requirements as any existing state or federal regulations. The proposed rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the South Coast AQMD.

Reference

In amending these rules, the following statutes which the South Coast AQMD 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 South Coast AQMD 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 South Coast AQMD rules and air pollution control requirements and guidelines which are applicable to PAR 1147 equipment.

The South Coast AQMD is not aware of any state or federal requirements regulating air pollution that are applicable to new or in-use PAR 1147 units. Because there are no state or federal requirements for PAR 1147 units, the proposed amendments are not in conflict with and do not duplicate any South Coast AQMD, state or federal requirement

APPENDIX A: COMMENTS AND RESPONSES

Comment Letter #1

Mr. Banuelos,

Regarding the proposed amended Rule 1147, I would like to contribute some inputs to the rule if possible:

- Most of Rule 1147 permit units emit very high CO emissions. These units are rarely tested for CO, probably one time for initial permits.
- These units should be monitored for CO frequently using portable analyzers similar to Rules 1146 and 1110.2
- Some of these units are highly diluted with ambient air. CO emissions should be limited to 400 ppm at 3%O₂ instead of 2000 ppm.

1 - 1

I believe you already incorporated these issues for the proposed rule. If so, please disregard this letter. Anyway, these are my observations during my testing career. Thanks for the opportunity to provide some comments.

Sincerely Yours,

Tim Dinh, Manager
Air Gas Testing & Consulting Services
7111 Garden Grove Blvd. Suite 118
Garden Grove, CA 92841
Phone: (714) 840-9827
Fax: (714) 840-6293
Cell: (562) 260-1302
Email: airgastesting@verizon.net

Staff Response to Comment Letter #1***Response 1-1***

Existing Rule 1147 does not currently regulate emissions of CO and existing CO limits of 2,000 ppm is based on guidance from *South Coast AQMD Rule 407 – Liquid and Gaseous Air Contaminants*¹⁰. Proposed Amended Rule 1147 (PAR 1147) will establish a new CO limit of 1,000 ppm corrected to 3% O₂ for applicable equipment with the exception for Turbines which are corrected to 15% O₂. In addition to the proposed tightened NO_x and new CO emission limits, PAR 1147 will also introduce periodic source testing requirements for NO_x and CO. The frequency of testing is based on unit size and additional information can be found in Chapter 3 of this staff report.

¹⁰ South Coast Air Quality Management District; Rule 407: <http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-407.pdf?sfvrsn=4>

Comment Letter #2

South Coast Air Quality Management District
Planning, Rule Development and Area Resources
21865 Copley Drive
Diamond Bar, CA 91765
Attn: Mr. Shawn Wang
VIA Email swang@aqmd.gov

January 24, 2022

RE: Proposed Rule Amendment #1147

Dear Mr. Wang:

It is with great interest that we read the notice of a Public Workshop for the potential change to Rule 1147. This potential change to NOx reductions is not to be taken lightly, and has potential major impacts on businesses like our that have industrial process ovens.

With a rule change must come consideration for the businesses that need to comply and how they will navigate that compliance. In this case, there are major concerns about the marketplace and what this proposed rule change will cause. Changing a rule without consideration of how that rule will be followed is irresponsible. This is potentially one of those issues.

The marketplace has a severe shortage of available low NOx burners to convert to in order to comply with the new rule. The reason, there have only been two real manufacturers of these type of burners, Honeywell and Maxon. Even with these two manufacturers running at full capacity the marketplace has been short on burners and waiting for them has been a very long proposition. Today there is one MAJOR change. Honeywell has bought Maxon and has now limited the marketplace even more. Here is the article on that sale [https://www.reliableplant.com/Read/8980/honeywell-agrees-to-buy-maxon-corporation-for-\\$185m](https://www.reliableplant.com/Read/8980/honeywell-agrees-to-buy-maxon-corporation-for-$185m). A copy is also attached herewith.

2 - 1

It would be irresponsible for the SCAQMD to implement these rule changes at this time. There are simply not enough burners available and this will cause the business owners to be in non-compliance if they are cited and can't get the equipment necessary to make the changeover. We have experienced this in the recent past and know that it is nearly impossible to get these burners. This sale should have been better scrutinized by the SEC but was overlooked due to its relatively small market size.

We urge the SCAQMD to reconsider this rule change as being one that is making it impossible for businesses to comply with at this time.

Sincerely,
ANDREWS POWDER COATING, INC.

Scott C. Andrews
President
10138 Canoga Ave. • Chatsworth, California 91311-4947
Phone (818) 700-1030

www.powdercoater.com

Staff Response to Comment Letter #2***Response 2-1***

Along with introducing tightened emission limits for NO_x as well as new emission limit for CO, PAR 1147 also provides an extended compliance schedule of 32 years after burner installation for Units meeting existing Rule 1147 limits outlined in Table 1 of PAR 1147. During the 2011 amendment to Rule 1147, final implementation of rule limits initially adopted in 2008 was expected to be in 2019. As such, staff expects most non-RECLAIM Rule 1147 facilities would have achieved compliance with emission limits outlined in Table 1 in 2019 and will not have to immediately submit applications to comply with the proposed tightened limits. Only facilities that do not have permit limits at the level of existing Rule 1147 limits need to submit permit applications to comply with new tightened limits of PAR 1147 by the first application submittal deadline of July 1, 2023. Additional information on the proposed compliance schedule for PAR 1147 can be found in Chapter 3 of this staff report.

Comment Letter #3

02/02/2022

Michael Morris
Planning and Rules Manager
SCAQMD
mmorris@aqmd.gov

Dear Mr. Morris,

In the proposed 1147 rule language the monthly hourly limit to demonstrate less than 1 pound per day of NOx emissions was eliminated.

By eliminating the monthly hourly limit, it takes away flexibility from companies to remain compliant.

This seems to run counter to the goal of lowering overall NOx emissions. As an example, a company could run their <1,000,000 BTU equipment one day a month for 9 hours and be in violation of the rule while another company could run their <1,000,000 BTU equipment daily for 7 hours a day 30 days a month and be compliant with the rule even though they are releasing more NOx.

If the goal of 1147 is to limit NOx emissions, the monthly hourly limit reduces NOx emissions more than the daily hourly limit. A company following the monthly hourly limit is only able to run their equipment the equivalent of 8 hours a day for 22 days a month. While a company following the daily hour limit could operate their equipment 30+ days a month at 8 hours a day which would emit more NOx than the company following the monthly hourly limit.

For our operations the monthly hourly limit works well because it gives us the flexibility to run longer than 8 hours in a day at a reduced number of days a month. We only run our equipment 4 days a week but must run it longer than 8 hours to meet our production needs. Adding another day of operation to our work week is not possible due to the large amount of setup and breakdown the equipment requires each day it is run.

We are requesting that the monthly hourly limits to demonstrate less than 1 pound per day NOx emissions remain unchanged from the current version of 1147. This will be mutually beneficial to SCAQMD and our company because it will continue to limit the NOx emissions our company generates while giving us the ability to meet our production needs and remain compliant with rule 1147.

We appreciate you taking our comments into consideration and look forward to hearing your thoughts. Please let us know if you have any questions or would like to discuss any items further.

Thank you,

Julian Iannini
Director of EHS
Interspace Battery Corporation
2009 W. San Bernardino Rd.
West Covina CA 91790
626-813-1234 ext 274
jiannini@concordebattery.com

Interspace Battery Corporation
2009 San Bernardino Road, West Covina, California 91790 USA
Telephone 626-813-1234 | Fax 626-813-1235

3 - 1

Staff Response to Comment Letter #3***Response 3-1***

PAR 1147 provides an exemption from the emission limits of Tables 1 and 2 for low-emitting units that demonstrate daily emissions of less than one pound per day of NOx. The daily emission demonstration provisions have been updated to allow owners or operators of low emitting units to demonstrate NOx emissions of less than one pound per day by calculating monthly NOx emissions of less than 30 pounds. Calculations can be done with non-resettable hour meter or non-resettable gas meter. Additional information on calculation of less than one pound per day can be found in Chapter 3 of this staff report. The monthly demonstration option will provide flexibility for owners and operators that operate equipment a few days of the month that potentially could exceed one pound per day but emit less than one pound per day on a monthly average.

Comment Letter #4
**ENVIRONMENT
& HEALTH**

Mr. Michael Morris
 Planning and Rules Manager
 South Coast Air Quality Management District
 21865 Copley Drive
 Diamond Bar, CA 91765

**COMMENTS ON PROPOSED AMENDED RULE 1147 NO_x REDUCTIONS
 FROM MISCELLANEOUS SOURCES**

Dear Mr. Morris:

Date: February 9, 2022

4 - 1

Ramboll US Corporation (Ramboll) is pleased to submit this comment letter on behalf of its client, American Airlines, Inc., Los Angeles International Airport station (AA LAX, Facility ID 800196). AA LAX owns and operates three portable aircraft start-up (ASU) microturbines (device IDs D162, D163, and D164) fueled with diesel (manufacturer Rheinmetall Model MSU 200T) rated at 0.296 megawatts (MW) that would be subject to Proposed Amended Rule (PAR) 1147 once amended. This letter provides comments on draft rule language for PAR 1147 discussed at the Public Workshop on January 27, 2022, as it relates to device IDs D162, D163, and D164.

Ramboll
 350 South Grand Avenue
 Suite 2800
 Los Angeles, CA 90071
 USA

T +1 213 943 6300
 F +1 213 947 1116
www.ramboll.com

4 - 2

As previously discussed with South Coast Air Quality Management District (AQMD) staff in person on June 13, 2019 and via email on June 18, 2019, May 14, 2020, and September 23, 2020, American Airlines believes that the appropriate Best Available Retrofit Control Technology (BARCT) emission limit for the ASUs is the current permit limit 77 parts per million by volume (ppmv) at 15% oxygen (O₂). As provided with the comment letter dated September 23, 2020 (see Attachment A), American Airlines determined an BARCT emission limit for the ASUs based on the cost effectiveness analysis, the extremely difficult application of selective catalytic reduction (SCR) to these microturbines, and the demonstrated low oxides of nitrogen (NO_x) emissions due to limited operation of these microturbines. Based on feedback in previous discussions and working group meeting presentations, we understood that the South Coast AQMD agreed the appropriate BARCT emission limit for the ASUs was the current permit limit 77 ppmv at 15% O₂. As currently drafted, PAR 1147(d)(9) does not provide an exemption from the emissions limits in Table 2. Therefore, we request PAR 1147(m) be revised to include a paragraph (e.g., PAR 1147(m)(12)) as follows:

"Emission requirements of (d)(2), (d)(3), (d)(5), and Table 2 shall not apply to owners or operators of an in-use distillate fuel-fired Turbine permitted prior to [Date of Adoption] in compliance with (d)(9)".

Also, as currently drafted, PAR 1147(d)(9) would require an owner or operator of an in-use distillate fuel-fired turbine permitted prior to adoption of PAR 1147 subject to

4 - 2
cont'd

emission limits of Table 1 to submit a permit application by July 1, 2023 to add a permit condition of annual fuel throughput limit of 13,800 gallons/year. In the current permit for AA LAX, the existing permit condition C1.17 limits fuel usage at device IDs D162, D163, and D164 to no more than 13,769 gallons per year. We request the rule language in (d)(9)(A) be changed as follows:

"Submit a permit application by July 1, 2023 to add a permit condition to the Permit to Operate that requires compliance with an annual fuel throughput of 13,800 gallons/year *unless an existing permit condition requires compliance with an annual fuel throughput of less than or equal to 13,800 gallons/year*"

Additionally, as currently drafted, PAR 1147(h)(1)(A) requires a source test period of at least 15 minutes of combustion system operation. In accordance with Regulation XX, the approved source test protocol for device IDs D162, D163, and D164 requires six minutes of combustion system operation (i.e., five minutes for start-up and warm-up period with no load connected then one minute with a load bank). Therefore, a source test pursuant to PAR 1147 could not be used to demonstrate compliance with Regulation XX. We request that PAR 1147(h)(1) allow for source tests to be performed pursuant to an approved source test protocol in accordance with Regulation XX.

Finally, the definition of "turbine" in PAR 1147(c)(33) has a typo and we believe was intended to state, "portable equipment that will reside at the same location for no more than 12 consecutive months".

If there are any questions, please feel free to contact me at (213) 943-6360.

Yours sincerely

Joseph Hower, PE, DEE
Principal and Vice-President – Mechanical Engineering

D 213.943.6319
jhower@ramboll.com

M. Scott Weaver, QEP
Principal

D 213.943.6360
msweaver@ramboll.com

MM:eg

cc: Shawn Wang, Gary Quinn, and James McCreary; South Coast AQMD
John Haney and Ioane Etuale, AA LAX
Melissa McMeechan, Ramboll

2/2

Staff Response to Comment Letter #4*Response 4-1*

Staff appreciates the feedback and has worked with the facility during the rulemaking process including one site visit to observe the equipment mentioned in this letter.

Response 4-1

Staff agrees with the commenter that BARCT for in-use distillate turbines less than 0.3 MW is 77 ppm at 15% O₂ as shown in PAR 1147 Table 1. Clarifications have been made in PAR 1147 which provides the extended compliance schedule for the in-use distillate turbines and the units will be required to submit permit applications to meet tightened limits of PAR 1147 once the units become 32 years of age. To further clarify the applicability of the fuel usage limit for in-use distillate fuel turbines in PAR 1147, rule language has been updated to allow for permit limits of below 13,800 gallons of fuel per year.

To account for facilities with existing approved protocols for Regulation XX compliance, PAR 1147 subdivision (h) will also include provision to accept source testing periods as part of previously approved protocols that may differ from the existing provisions of at least 15 minutes in PAR 1147.

Staff has discussed with the commenter the definition for “Turbine” in PAR 1147 and came to consensus to maintain existing definition unchanged.


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261 Euclid Ave.
Long Beach, CA 90803
562-433-3025

February 9, 2022

Mr. Michael Krause
Assistant Deputy Executive Officer For Rules and Planning
South Coast Air Quality Manage District
21865 Copley Drive
Diamond Bar, CA 91765

RE: Comments Relating to PAR 1147 Staff Report

Dear Mr. Krause,

I have reviewed the PAR 1147 Preliminary Draft Staff Report. Below provides some elements of concern as to the projected NOx ppm value for <1200D and > 1200F devices. To that end I offer the following thoughts for your review and consideration.

General thoughts:

- 1) In 2008, prior to rule implementation, I recommended that staff provide an implementation document since many of the companies involved were small and not familiar with rule ease. We suggested that this document be written in plain English not legalese. I was concerned that the compliance level would be small. After the first compliance deadline inspectors went into the field and found that the compliance level was about 5%. 5 - 1
- 2) When RECLAIM was developed, there were many of very detailed implementation documents that assisted the regulated community in the understanding of the new rule. I firmly believe this is needed for both 1147.2 and 1147.

Concerns on Proposed Rules:

- 1) The all too broad classification of a type of equipment as “each class or category of source” is problematic in that there are a very large number of one-of-kind pieces of equipment within a single designation of equipment. Where this is valid is in categories such as IC Engines and Boilers where manufacturers build identical model number devices, in some cases by the thousands. Many of the devices covered in 1147 have a significantly different configurations within a specific device description that include BTU inputs, physical sizes and also purposes of use. 5 - 2
- 2) Whereas staff has multiple source tests to signify acceptability, the specific details are not presented in enough detail to deem an acceptable ppm value for the group as a whole. We have included a chart that illustrates Eclipse ThermJet burners of different input that illustrate that even within a

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261 Euclid Ave.
 Long Beach, CA 90803
 562-433-3025

specific burner designation the exit velocities can vary from 300 mph to 468 mph depending on the input. In the chart it shows the NOx ppm at high fire and a lower firing rate. You can see the numbers vary significantly. Also is a chart for the Eclipse Winnox model designations that also show the same high fire and lower firing rate NOx values. These too also vary significantly. To that end where a specific burner may show good source test results on a particular device, the use of a different burner model on a different device within a specific class or category will not yield the same results. Even with the same model number of burner, the results can vary due to the custom designed and engineered device. We have seen that the same burner type but with a different BTU input can yield a low of 9 ppm and a high of 25 ppm on the same type of device in the same plant.

5 - 2
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- 3) Due to this variability in types of equipment the over generalization of emission values of 20 ppm for devices <1200°F and 30 ppm for devices >1200°F is not only overly optimistic but unrealistic. The net effect is the requirement that cannot be met due to highly specific criteria of devices will place the permit holder in a difficult position of needing to comply – yet left with no viable avenue of compliance and thus in jeopardy of fines.

Source Test Results:

- 1) Staff has provided source test results for a number of devices that illustrate the efficacy of the 20 ppm or 30 ppm limits. However, there are literally hundreds of devices that were never tested or were over these limits. Therefore, to deem as acceptable the proposed limits creates a false impression that all devices within a specific category can comply with the proposed limits. We think some concerted thought needs to be initiated into the totality of the sources to substantiate if the values are actually valid for each of the designated category of equipment.
- 2) According to the Staff Report page 1-6 there are 5,300 devices from 3,000 facilities included in the revised Rule 1147. Please provide the number b-cats that were evaluated in each category of the evaluation. In a Public Records Request in 2009 staff indicated that there was a total of 260 b-cats included. Within each source category there can be multiple b-cats. Please provide the number of b-cats that were evaluated. This should be broken down to the number of devices within each of the b-cats that were under 1200°F and number of b-cats over 1200°F. This is important for the public to evaluate the completeness of the evaluations. A critical element to understanding of source test results include not only the specific data for each device but also the firing rate during the source testing. Typically, a device that is tested when firing harder will yield a lower NOx value. This is generally universal across all devices. A device that is operating at 60% of maximum will yield lower ppm values than the same device operating at 20% of maximum. This needs to be taken into consideration in the evaluation of source test data.
- 3) On page 2-3 under the afterburner, et.al. grouping the input range went from <1 MMBTU/hr to 189 MMBTU/hr. Needless to say, there is a vast difference in the range of <1 MMBTU/hr to 189 MMBTU/hr, this includes purpose, input, configuration, burner selection, etc. That being said, it

5 - 3

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 562-433-3025

would be difficult to be able do draw a conclusion that 20 ppm is technically feasible for all units in the group. Please provide a higher degree of specificity as to the efficacy of the 20 ppm.

- 4) On page 2-5, the writeup indicates that 9 of the 68 units source tested devices were below 30 ppm. This represents only 13.2% of the group that were below 30 ppm. We believe this cannot possibly be an acceptable representation of a finding of 30 ppm as a new limit for the group. Please provide the rational behind this finding of such a low percentage to be an acceptable limit.
- 5) As with the above, evaporator, fryer, heated process tank or parts washer, the sampling shows 8 of 51 devices at the <60 ppm value. Due to the significant differences in these devices, only 15.6% tested below 60 ppm. Please provide detailed information as to which b-cats were studied, what burners were used configuration of the devices and the input of the burners.
- 6) Page 2-6 for ovens, dehydrator, dryer, heater, kiln calciner, cooker, roaster, furnace, or heated storage tank grouping there are 1,509 devices only 728 of those were chosen to be representative or 48% of the total group. However, of those only 201 were evaluated from source test data. That means that only 13.3% of the total group were used in the evaluation. Because of the vastness of this group and the large number of custom designed and engineered devices, please provide the number of b-cats in each group that were studied, and a description of each devices studied. It is difficult to understand that such a small representation of the total were used to validate the finding of either 20 or 30 ppm.

5 - 3
 cont'd

General Concerns:

- 1) In the examples above there is a relatively small number of source tests used to justify the proposed rule values. We respectfully request a complete listing of b-cats used in the studies and complete description of the specific devices be provided to the public.
- 2) For staff to show an acceptable percentage of devices compliant with the proposed rule a more complete evaluation is necessary. When the representative sample is very low for justification of limits, it would not look good for the rule making process if only 20% of the devices were found to comply or are capable of complying with the stated limits.

5 - 4

Cost Effectiveness Evaluations:

- 1) We are concerned that the methodology used to justify the stated cost effectiveness values are too low. To that end, we would like to see the actual numbers used in the evaluations. This would include which b-cats were evaluated, the quantify of devices <1200°F and >1200°F in each b-cat. The data would include burner costs, installation costs (including piping, electrical, engineering) from vendor quotes, commissioning costs, etc. We are not interested in the facility ID or permit numbers. In some evaluations for the 1147.2 devices, the numbers can be over \$500,000/controlled ton of emissions reduced. Therefore, the exact numbers are important as well as the quantity of devices evaluated.

5 - 5

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 Long Beach, CA 90803
 562-433-3025

- 2) Whereas, the staff report indicates that devices were evaluated on an individual basis, none of the individual data is presented.
- 3) The identified limit for cost effectiveness has been stated at \$50,000/ton. Our concern is that the actual value is dramatically above the stated limit, what options are available to the permit holder. We would recommend that a permit holder would conduct a complete evaluation of all costs associated with the retrofit presented to staff for evaluation. If the numbers are excessively high, a temporary off ramp be established for a 3-year period. This would be in the form of a letter in the permit holders file that staff has evaluated the data presented and concurs with the numbers. In three years, another evaluation is completed to determine if the values, due to technology, have been reduced to an acceptable value.
- 4) Page 2-17 indicates that without the use of AER information a national capacity factor be applied of 80%. The question is, does this number refer to a production output of the plant product or the BTU input of the equipment. We have looked at a variety of different industries – forging, heat treating, autobody heated booths, powder coating, etc. We looked at the PTE of all the devices in the plant and compared that number with the Gas Company invoices to determine the % of PTE actually realized. Those numbers ranged from 10.65% to 19.9% PTE. Staff has this information based on the AERs presented. We feel the 80% has no relevance to combustion equipment utilization.

5 - 5
 cont'd

Overall Comments:

Whereas we appreciate the amount of work done by staff, more complete analysis needs to be presented to the public to quantify the numbers provided in the staff report. Please let us know when this information will be available.

5 - 6

Sincerely,

Anthony W. Endres
 President

cc. Mr. Gary Quinn, P.E.
 Mr. Shawn Yang

Enc.

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Staff Response to Comment Letter #5Response 5-1

After adoption of PAR 1147, staff is committed to developing an implementation guidance document to help businesses comply with rule requirements. In addition, staff will develop and distribute an updated outreach pamphlet that was initially released in 2019.

Response 5-2

During the 2017 rule amendment for Rule 1147, South Coast AQMD staff completed a technology assessment which was independently reviewed by ETS, Inc. The third-party review of the 2016 Technology Assessment for Rule 1147 equipment generally supported the equipment grouping established in Rule 1147; however, considerations were made from discussions with stakeholders during rulemaking for PAR 1147 which resulted in creation of new equipment categories due to their unique challenges. New categories such as Autoclaves, Tunnel Kilns, Chillers, and Turbines <0.3 MW were established based on stakeholder feedback.

During the technology assessment for PAR 1147, staff reviewed over 430 source test reports from equipment impacted by PAR 1147 to determine the staff recommendations for BARCT emission limits. Further detail on technology assessment for PAR 1147 can be found in Chapter 2 of this staff report.

Response 5-3

As previously stated in response 5-3, staff evaluated results from over 430 source test results from equipment subject to PAR 1147 to establish emission limits for PAR 1147. Source test data is collected from equipment during normal operation. Staff agrees that burner load does impact emissions performance of burners; however, this can be mitigated with proper burner sizing. As part of research conducted during the 2017 Technology Assessment review, ATS identified the following article by Matt Brueck of Maxon Corporation which provides an overview of differences between traditional burners and low NOx burners:

¹¹Traditional oven burners have higher thermal turndowns than low emission oven burners. Because of this, low NOx oven burners should never be oversized. In the past, a larger-than-necessary burner may have been used without concern for overheating the oven at low fire. Now it is recommended that engineers look closer at an oven's heat balance, especially at low fire. In short, use the smallest low NOx burner possible for any application below about 5,000,000 Btu/hour.

The technology assessment was also conducted based on individual equipment categories with discussions from equipment manufacturers. Proposed limits of PAR 1147 were established with feasibility from source test results, current permit limits, as well as discussions from manufacturers.

During the initial stages of PAR 1147 development, staff developed and evaluated a list of applicable basic equipment category (BCAT) and control equipment category (CCAT) numbers associated with miscellaneous combustion equipment. Numbers that were no longer in use were removed from the evaluation, and new numbers were added to account for newly established PAR 1147 equipment categories. The final count of BCAT and CCAT numbers evaluated totaled around 200. It is important to note that the list of BCAT and CCAT numbers used in the assessment are

¹¹ Brueck, Matt; California Emissions Standards Met With Oven Retrofit, Process Heating, May 1, 2002.

inherently grouped based on their respective PAR 1147 equipment categories and generally do not reference process temperatures for most instances.

Response 5-4

Furnishing the complete list in a response format here will not add value to the staff report; the commenter may submit a California Public Records Act request for any extraneous records that are subject to release.

As part of developing PAR 1147, staff conducted a comprehensive technology assessment of all existing and new equipment categories. From that technology assessment, the proposed limits of PAR 1147 are determined to be feasible. Staff also developed an extended compliance schedule for equipment that complies with existing Rule 1147 limits where most equipment impacted by PAR 1147 would not need to submit applications to comply with the new tightened limits until the burner becomes 32 years of age, which is the expected time of natural equipment turnover.

Summary of the technology assessment can be found on Table A-1 below:

Table A-1: Summary of Technology Assessment

Equipment Category	Operating Temperature	Staff Recommendation¹	# of Source Test Meeting Staff Recommendation
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	20 ppm	87 out of 196
	≥1,200°F	30 ppm	3 out of 5
Tunnel Dryers	<1,200°F	30 ppm	1 out of 1
	≥1,200°F	60 ppm	5 out of 5
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	20 ppm	54 out of 80
Remediation Unit	All	60 ppm	No Source Test Identified, No Change in Rule Limit
Evaporator, Fryer, Heated Process Tank, and Parts Washer	All	60 ppm	8 out of 8
Burn-off Furnace, Burnout Oven, Incinerator, Crematory with or without Integrated Afterburner	All	30 ppm	10 out of 68
Tenter Frame, Fabric or Carpet Dryer	All	20 ppm	1 out of 29
Other Unit and Process Temperature	<1,200°F	30 ppm	No Source Test Identified, No Change in Rule Limit
	≥1,200°F	60 ppm	
Chillers	All	20 ppm	12 out of 12

Equipment Category	Operating Temperature	Staff Recommendation ¹	# of Source Test Meeting Staff Recommendation
Micro-Turbines (All Other)	All	9 ppm	17 out of 17
Micro-Turbines (In-Use Distillate Fuel)	All	77 ppm	3 out of 3
Rotary Dryers	All	30 ppm	1 out of 1
Auto-Claves	All	30 ppm	2 out of 2
All Liquid Fuel-Fired Units	<1,200°F	40 ppm	No Source Test Identified, No Change in Rule Limit
	≥1,200°F	60 ppm	

Response 5-5

Cost effectiveness methodology is outlined in Chapter 2 of this staff report including the method used and comparison between discounted cash flow and levelized cash flow. Equipment cost as well as installation cost curves are shown in Figure 2-12 of this staff report. Category specific average for cost effectiveness as shown in Table 2-2 of this staff report is calculated using a bottom-up approach which considers individual equipment costs. As part of the cost effectiveness analysis, staff calculates emissions for equipment usage based on either actual emission such as AER reported emissions or the average industrial production and capacity utilization released by the United States Federal Reserve printed on February 7, 2011¹². The average capacity utilization of 80% was only used if real world emissions data was not available.

PAR 1147 also provides an extended compliance schedule for equipment already in compliance with existing Rule 1147 emission limits. From the 2011 amendment of Rule 1147, the final implementation of Rule 1147 limits established in 2008 was in 2019. Therefore most, if not all equipment located at non-RECLAIM facilities applicable to Rule 1147, would need to submit permit applications to comply with applicable PAR 1147 emission limits when the burner reaches 32 years of age.

Response 5-6

Staff appreciates the commenter's feedback throughout rulemaking for PAR 1147. As previously mentioned in Response 5-4, a comprehensive technology assessment, summarized in Table A-1, was conducted along with cost effectiveness assessment to establish staff recommendations for emission limits and compliance schedule for PAR 1147. Staff also had communications with individual stakeholders and equipment manufacturers.

¹²Federal Reserve Statistical Release G.17, Industrial Production and Capacity Utilization http://www.federalreserve.gov/releases/g17/cap_notes.htm as printed on February 7, 2011.