SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Staff Report
Proposed Amended Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Rule 1111 reduces emissions of nitrogen oxides (NOx) from residential and commercial gas-fired fan-type space heating furnaces with a rated heat input capacity of less than 175,000 BTU per hour or, for combination heating and cooling units, a cooling rate of less than 65,000 BTU per hour. The rule applies to manufacturers, distributors, sellers, and installers of such furnaces.

The furnaces are categorized into four types by Rule 1111: 1) Non-condensing (standard); 2) Condensing (high efficiency); 3) Weatherized (e.g., outdoor); and 4) Mobile home furnaces. The compliance dates to meet the emission limit are different depending on the furnace type. The furnaces for installation at the high elevation regions can be any type but are most commonly non-condensing and condensing furnaces.

Rule 1111 was adopted by the South Coast AQMD Governing Board in December 1978 and amended in 1983, 2009, 2014, 2018, and 2019. The more significant changes included:

- The 2009 amendment lowering the NOx emissions from 40 to 14 nanograms per Joule (ng/J);
- The 2014 amendment providing an alternate compliance option that allows the original equipment manufacturers (OEMs) to pay a per unit mitigation fee, in lieu of meeting the new lower NOx emission limit, for up to 36 months past the applicable compliance date;
- The March 2018 amendment extending the mitigation fee alternate compliance option and increasing the mitigation fee; and
- The December 2019 amendment providing a limited exemption from the 14 ng/J emission limit for condensing and non-condensing furnace installations at elevations greater than or equal to 4,200 feet above sea level until October 1, 2020.

The compliance date has passed for condensing and non-condensing furnaces for installation at elevations below 4,200 feet above sea level. The current compliance dates for meeting the 14 ng/J NOx emission limit are: October 1, 2019 for condensing and non-condensing furnaces; October 1, 2020 for weatherized furnaces; October 1, 2021 for mobile home furnaces; and October 1, 2020 for installation of condensing and non-condensing furnaces at elevations greater than or equal to 4,200 feet above sea level (high-altitude installation).

Staff has been closely monitoring the progress of commercialization of compliant weatherized furnaces and testing of condensing and non-condensing furnaces for installations in high-altitude areas, as the October 1, 2020 compliance date approaches. Original Equipment Manufacturers (OEMs) have discussed how the COVID-19 pandemic has affected their business operation and their progress in commercializing Rule 1111 weatherized and high-altitude compliant furnaces. OEMs have also commented that the supply chains for certain parts from overseas or Mexico affected existing and future production, and travel restrictions have impacted the completion of high-altitude testing for some OEMS. In addition, some OEMS have expressed how the pandemic is affecting their overall business decisions on the development of compliant products.

The OEMs are continuing to release more ultra-low NOx models to the market for condensing and non-condensing furnaces. Manufacturing defect which caused previous reports of furnaces overheating were identified by the furnace manufacturer and modifications were made to resolve

the problem. There are no new reported large-scale issues regarding excessive noise or overheating for the current models in the market.

As for weatherized units, the rule does not distinguish between residential and commercial units. Based on discussions with OEMs on the commercialization status of weatherized units, some OEMs have different schedules for residential and commercial units. Out of the seven OEMs, three OEMs are expecting to have models available that will meet the October 2020 deadline for residential and commercial applications, two OEM expects they will not meet the October deadline for residential or commercial application, and two OEM has suspended any efforts to meet the deadline. Staff worked with OEMs to determine if there was a clear, enforceable definition to make the distinction between residential and commercial weatherized units such as defining these two categories of weatherized furnaces as either single-phase or three-phase units. This definition, however, was not consistent for the seven manufacturers. Staff is recommending that PAR 1111 extend the mitigation fee for all weatherized units for one year, and to provide a consumer rebate of $500 to incentivize installation of the 14 ng/J furnaces until September 30, 2021.

With regards to high altitude furnace installations, all seven furnace manufacturers are expecting to have compliant 14 ng/J NOx condensing and non-condensing furnaces available for installation at varying elevations between 4,200 feet to 7,800 feet above sea level by the October 2020 deadline. However, only two OEMs can currently provide compliant condensing and non-condensing furnaces certified for installations at around 6,800 feet and above that could service all mountain communities in the South Coast AQMD, including Big Bear City. One additional manufacturer has expressed optimism in certifying their product for elevations up to 7,000 feet above sea level by October 1, 2020. Three of the OEMs expressed concern that company travel restrictions due to the recent COVID-19 pandemic will likely delay their ability to test in high elevations and thus, delay development and commercialization of compliant furnaces to these high-altitude areas for 3 to 6 months. Staff is recommending that PAR 1111 extend the compliance date for condensing and non-condensing units installed at elevations 4,200 feet or higher for one year, and to provide a consumer rebate of $500 to incentivize installation of the 14 ng/J furnaces until September 30, 2021.

Four OEMs and the Air Conditioning, Heating and Refrigeration Institute (AHRI) have requested that has urged the South Coast AQMD staff to consider allowing a gas-electric dual fuel split system equipped with a noncompliant 40 ng/J furnace as an alternative compliance option. A dual fuel split system, which is composed of a separate electric heat pump that provides heating and cooling paired with a gas furnace that provides heat below a certain external temperature threshold. These OEMs requested that Rule 1111 allows dual fuel split systems the installation of to use a noncompliant 40 ng/J furnace when paired with an electric heat pump. Three other OEMs do not support expressed opposition to that Rule 1111 allows the allowance of dual fuel split systems to use with a noncompliant 40 ng/J furnaces because as it undercuts development and commercialization of compliant 14 ng/J furnaces that can also be used in a dual fuel split system.

Based on the discussion with the manufactures and contractors, Proposed Amended Rule 1111 will:

- Extend the existing mitigation fee alternate compliance option for weatherized units for one year until September 30, 2021;
- Extend the exemption for high altitude condensing and non-condensing furnace installations for one year until September 30, 2021;

- Allow installations of dual fuel systems with noncompliant 40 ng/J NOx furnaces, with conditions, at elevations above 4,200 feet above sea level until September 30, 2022; and
- Require manufacturers, distributors, and installers of 40 ng/J NOx furnaces for operation as propane-firing only and dual fuel systems with noncompliant 40 ng/J NOx furnaces to maintain recordkeeping of sales and installations.

Initially staff was proposing to extend the compliance date to March 31, 2020; however, based on input from stakeholders, PAR 1111 will extend the compliance deadline to September 30, 2021 tol allow for a smoother transition as it will be after the heating and cooling season. Allowing dual fuel systems with 40 ng/J NOx furnaces will provide additional options for consumers in high altitude areas after the end of exemption for high altitude areas while allowing additional time for furnace OEMs to expand high altitude guidance for existing ultra-low NOx furnaces.

CHAPTER 1: BACKGROUND

INTRODUCTION
REGULATORY HISTORY
EQUIPMENT AND PROCESS
REQUIREMENTS AND TESTS FOR NEW TECHNOLOGY
AFFECTED INDUSTRIES
PUBLIC PROCESS

INTRODUCTION

The purpose of Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces is to reduce NOx emissions from residential and commercial gas-fired fan-type space heating furnaces with a rated heat input capacity of less than 175,000 BTU per hour or, for combination heating and cooling units, a cooling rate of less than 65,000 BTU per hour. The rule applies to manufacturers, distributors, sellers, and installers of such furnaces. It requires manufacturers to certify that each furnace model offered for sale in the South Coast AQMD complies with the emission limit using the test methods approved by the South Coast AQMD and U.S. EPA. In lieu of meeting the lower emission limit, Rule 1111 has provided manufacturers an alternate compliance option of paying a per-unit mitigation fee for up to 4 to 4.5 years past the applicable compliance date, depending on the furnace type, which includes non-condensing, condensing, weatherized, and mobile home furnaces. Most single-family homes, many multi-unit residences, and some light commercial building in the South Coast AQMD use this type of space heating equipment.

REGULATORY HISTORY

Rule 1111 was adopted by the South Coast AQMD Governing Board in December 1978. The original rule required residential and commercial space heating furnaces to meet a NOx emission limit of 40 nanograms per Joule (ng/J) of heat output (equivalent to 61 ppm at a reference level of 3% oxygen and 80% Annual Fuel Utilization Efficiency (AFUE)) beginning January 1, 1984.

In November 2009, Rule 1111 was amended to implement the 2007 Air Quality Management Plan (AQMP) Control Measure CMB-03. The 2009 amendment established a new lower NOx emission limit of 14 ng/J (equivalent to 22 ppm at a reference level of 3% oxygen and 80% AFUE), and required the three major categories of residential furnaces – condensing (high efficiency), non-condensing (standard), and weatherized furnaces to meet the new limit by October 1, 2014, October 1, 2015, and October 1, 2016, respectively. Furthermore, new mobile home heating units, which were unregulated prior to the 2009 amendment, were required to meet a NOx limit of 40 ng/J by October 1, 2012 and 14 ng/J by October 1, 2018. To facilitate the depletion of existing inventories and to ensure a smooth transition to the new limits, Rule 1111 also provided a temporary 10-month exemption (a sell-through period) for units manufactured and delivered into the South Coast Air Basin prior to the compliance date.

14 ng/J Technology Development Projects

Four technology development projects were initiated in 2010 and completed in 2013, funded by the South Coast AQMD, the Gas Company, and San Joaquin Valley APCD with a total amount of $1,447,737. Participants of the technology demonstration projects include Beckett Gas, Gas Technology Institute, Ingersoll Rand (Trane Technologies), and Nordyne (Nortek). The scope of the project for each participant as well as the contract reward amounts are shown in Table 1 - Summary of Rule 1111 Technology Demonstration Projects. Through those projects, prototype furnaces were developed demonstrating that the new lower Rule 1111 NOx limit of 14 ng/J is achievable for forced air residential heating furnaces.

Table 1 – Summary of Rule 1111 Technology Demonstration Projects

Participants	Award Amount	Project Scope
Beckett Gas	$379,386	Two furnaces: - Condensing - Non-Condensing
Gas Technology Institute (GTI)	$450,000	One furnace each for five manufacturers: - Carrier Corporation - Johnson Controls Incorporated - Rheem Manufacturing Company - Lennox International - Thermo Products LLC
Ingersoll Rand (Trane Technologies)	$368,261	Two 2-stage furnaces: - Average heat output - Higher heat output
Nordyne (Nortek)	$250,090	Three furnaces: - Single Stage (On/Off) - 2-stage (High/Low/Off) - Modulating (High to Low to Off)

Mitigation Fee to Delay Compliance of 14 ng/J Furnaces

Rule 1111 was later amended in September 2014 to delay the compliance date for condensing furnaces and to provide an alternate compliance option. The alternate compliance option allowed OEMs to pay a per unit mitigation fee of $200 for each condensing furnace and $150 for each other type of furnace distributed or sold into the South Coast Air Basin, in lieu of meeting the 14 ng/J NOx emission limit. The mitigation fee end date was based on the furnace type which phased in the NOx limit of 14 ng/J over the period from April 1, 2018, to October 1, 2021.

Extension and Increase of the Mitigation Fee

Based on the lack of 14 ng/J furnaces that were commercialized in early 2018, Rule 1111 was amended in March 2018 to increase the mitigation fee in two phases to a range of $300 to $450, depending on the furnace type and heat input capacity, and extend the mitigation fee compliance option by 1.5 years for condensing furnaces, and one year for non-condensing and weatherized furnaces. Rule 1111 was also amended to provide an exemption from the mitigation fee increase for units encumbered in a contractual agreement by OEMs and distributors for new construction, if contracts were signed prior to January 1, 2018, and included provisions to address propane conversion kits for propane firing only furnaces.

Clean Air Furnace Rebate Program

In March 2018, a rebate program for consumers who purchase and install compliant 14 ng/J furnaces in the South Coast AQMD was initiated. The purpose of the rebate program was to help commercialize and incentivize consumers to purchase 14 ng/J furnaces. On May 4, 2018, the South Coast AQMD executed the contract with Electric & Gas Industries Association (EGIA) to administer the Clean Air Furnace Rebate Program. On June 28, 2018, the rebate website was launched (www.cleanairfurnacerebate.com). The South Coast AQMD Governing Board approved

funding of $3,000,000 for the furnace rebate program, specifying a $500 rebate for each compliant furnace. The program was suspended in May 2020 when the funds were exhausted.

High Altitude Furnaces

Rule 1111 was last amended in December 2019 to include a limited exemption from the 14 ng/J NOx emission limit that applies to manufacturers, distributors, sellers, and installers of condensing and non-condensing natural gas furnaces. This exemption applies to furnaces installed at elevations greater than or equal to 4,200 feet above sea level until October 1, 2020. During this interim exemption period, condensing and non-condensing furnaces installed in high altitude areas are still required to meet the 40 ng/J NOx emission limit. This rule amendment included recordkeeping requirements for manufacturers, distributors, and installers to track the distribution, sales, and installations of these furnaces. Verification of the elevation is based on U.S. Geological Survey data.

The adoption Resolution for the December 2019 amendment directed staff to update the Stationary Source Committee on the development of high-altitude furnaces and weatherized furnaces. This update was scheduled to occur no later than May 15, 2020. However, due to the impacts resulting from the COVID-19 pandemic on staff's ability to gather information on the OEM's implementation efforts, the update to the Board was delayed for one month. At the December 2019 Governing Board meeting Supervisor Janice Rutherford also requested staff to continue working with manufacturers, distributors, and installers regarding high-altitude installations, weatherized furnaces, and the potential of allowing hybrid dual fuel split systems that use noncompliant 40 ng/J furnaces.

Since the December Board meeting, staff has been periodically meeting with all furnace manufacturers to monitor the progress of compliant furnace development and commercialization. The market availability for condensing and non-condensing compliant furnaces has increased four-fold during the past year, with 448 models released to the market as of May 2020 compared to the 112 models in February 2019. Manufacturers did not initially report complaints regarding excessive noise issues for compliant furnaces; however, recently some contractors have reached out to staff regarding noise issues. Four out of seven furnace manufacturers have informed staff of reported noise issues. The cause of the noise issues is identified to be either installer error or defective components from third party suppliers. To resolve identified noise issues, manufacturers are taking steps to increase installer training and worked with part suppliers to revise identified parts. Prior to the October 1, 2019 compliance date, an early model had an overheating issue, but the manufacturer modified the model and resolved the issue. Staff is not aware of overheating or safety issues beyond this initial report which has been resolved.

EQUIPMENT AND PROCESS

Fan-type gas-fired furnaces heat a building by circulating air from inside the building (office, home, apartment, etc.) through the furnace. In a fan-type furnace, air is heated when it passes through a heat exchanger. Combustion gases heat up the inside of the heat exchanger, and air from the building that is moving past the outside of the heat exchanger removes heat from the outside surface. A blower (fan) pulls air through one or more intake ducts and pushes the air past the heat

exchanger and through another set of ducts, which direct the heated air to different parts of the building. The heated air circulates through the building before it is again pulled into the intake ducts and re-heated. This process continues until a specific temperature is detected by a thermostat in the building, which then shuts off the furnace. When the temperature at the thermostat goes below a set point, the thermostat sends a signal for the furnace to turn on.

Rule 1111 categorizes furnaces into four types: non-condensing, condensing, weatherized, and mobile home furnaces. Condensing furnaces, also called high-efficiency furnaces, utilize a second heat exchanger to recover the latent heat in the flue gas, achieving 90 to 98 percent fuel efficiency. Non-condensing furnaces only use one heat exchanger, with a typical fuel efficiency of about 80 percent. Weatherized furnaces are designed for installation outside of a building, equipped with a protective jacket and integral venting, and labeled for outdoor installation. A weatherized furnace is often referenced as package units by the heating, ventilation, and air conditioning (HVAC) industry as the furnace is packaged with an air conditioning condensing unit. A mobile home furnace means a furnace designed specifically and solely for installation to heat a mobile home.

Rule 1111 specifies a 14 ng/J NOx limit for gas-fired furnaces. This is different than an approach that is based on overall mass emissions for residential and commercial heating. A mass emissions approach would require some limitation on use to ensure the emissions from a unit with a higher emission rate than 14 ng/J would not be more emissive. For example, if a 40 ng/J furnace of the same size were allowed, its use would need to be limited to 8.4 hours per day to be less than a 14 ng/J furnace that operated for a full 24 hours. Staff does recognize that there are other types of configurations such as electric heat pumps, dual fuel split systems, with an electric heat pump and furnace, or a standalone furnace with or without air conditioning. Regardless of the configuration, Rule 1111 requires that when a gas furnace is used that it must meet the NOx limit in the rule.

Electric Heat Pumps

Electric heat pumps can provide heating and cooling with no combustion source and can replace an air conditioning unit and furnace. Heat pumps are electric heat transfer units utilizing compression and evaporation of refrigerant to release and absorb heat. Heat is absorbed when the refrigerant is evaporated at low pressure and released when the refrigerant is compressed at high pressure. Heat pumps consist of an outdoor and indoor unit, both equipped with a coil and fan. The coils located in both the outdoor and indoor unit can act as either a compressor or evaporator depending on whether the unit is in heating or cooling mode. The fans in both the indoor and outdoor unit move air across the coils to facilitate heat exchange. In heating mode, the outdoor unit absorbs heat by acting as an evaporator and the indoor unit releases heat by acting as a compressor. In cooling mode, the flow of the refrigerant and functions of the coils are reversed. By utilizing the reversable compression and evaporation cycles, a heat pump can move heat in and out of the home.

Dual Fuel Split Systems

Dual fuel split systems comprise of an electric heat pump paired with a gas furnace. The gas furnace has and continue to be subject to the emission limits in Rule 1111. Dual fuel split systems are available from all seven furnace OEMs with 14 ng/J furnaces.

For dual fuel split systems, the dedicated air handler of the indoor unit of an electric heat pump system is replaced with a gas-fired furnace which serves as the air handler for heating and cooling

when in all electric mode. In a dual fuel split system, when external temperatures drop below a specified temperature, the system will switch over from providing heat from the electric heat pump to providing heat from the gas-fired furnace. This is referred to as the "switchover temperature." When the external temperature rises above the threshold, the gas-fired furnace turns off and the electric heat pump resumes as the primary source of heat.

REQUIREMENTS AND TESTS FOR NEW TECHNOLOGY

Gas furnaces in the United States must meet the ANSI Z21.47/CSA 2.3 standard referred as CSA certification, mainly to ensure safety. To be sold and installed in the South Coast AQMD's jurisdiction, they must also be certified by the South Coast AQMD for Rule 1111 NOx emission limit compliance by specific test methods approved by the South Coast AQMD and U.S. EPA. OEMs could also be subject to other regulations, such as ANSI/ASHRAE/IES 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential building required by the U.S. Department of Energy (DOE), and AHRI certification program for verification test of output heating capacity and annual fuel utilization efficiency. For furnace installation, manufacturers provide extensive training programs and instruction material for the contractors and installers.

AFFECTED INDUSTRIES

Proposed Amended Rule 1111 affects manufacturers (NAICS 333), distributors and wholesalers (NAICS 423), and retailers and dealers (NAICS 444) of residential furnaces. Because heating units regulated by the rule are used in most residential and many commercial settings for heating small buildings, construction and building contractors and installers (NAICS 238 and 811) related to residential furnaces are also affected by PAR 1111. The Air Conditioning Heating and Refrigeration Institute (AHRI), the major manufacturer's trade organization, indicates that there are no manufacturers of fan-type gas-fired residential furnaces in the South Coast AQMD. However, these companies do maintain regional sales offices and distribution centers in the South Coast AQMD and there are manufacturers of other types of heating furnaces in the South Coast AQMD.

PUBLIC PROCESS

Staff has held ongoing individual meetings with the seven OEMs prior to and after the December 2019 Governing Board meeting. The discussions at these meetings included rule implementation status for compliant 14 ng/J condensing and non-condensing, high elevation, and weatherized furnaces. Also discussed at these meeting was the potential of utilizing dual fuel technology to comply with the Rule 1111 NOx emission limit. The meetings were held individually to provide each OEM the ability to speak about confidential information regarding their technology development.

The progress of compliant furnace commercialization and the proposed amendment were discussed during public working groups on June 10, 2020 and July 9, 2020. A Public Workshop was held on July 15, 2020.

CHAPTER 2: SUMMARY OF PROPOSED AMENDED RULE 1111

PROPOSED AMENDED RULE REQUIREMENTS

PROPOSED AMENDMENTS TO RULE REQUIREMENTS

The South Coast AQMD staff has been closely monitoring the progress of commercialization of weatherized compliant furnaces, accounting for and assessing the impacts resulting from the COVID-19 pandemic. Based on discussions with OEMS, Proposed Amended Rule 1111 will extend the compliance date from October 1, 2020 to September 30, 2021, for both the mitigation fee alternative compliance option for weatherized units and the exemption for installing condensing and non-condensing furnaces at high altitude areas. Other existing requirements are currently proposed to remain unchanged.

Four OEMs and AHRI urged the South Coast AQMD staff to consider allowing a dual fuel split system with a noncompliant 40 ng/J furnace as an alternative compliance option. A dual fuel split system is a separate electric heat pump paired with a natural gas furnace. The system first operates the heat pump until it reaches a set temperature (e.g., outside temperatures drop to less than 32 degrees F) at which point the gas furnace is switched on and operated. Staff supports the use of heat pumps and dual fuel split systems with compliant 14 ng/J NOx furnaces. Staff is concerned that a dual fuel system with a 40 ng/J NOx furnace will allow noncompliant furnaces to enter the Basin creating additional enforcement challenges.

Rule 1111 Definitions (Subdivision(b))

The following definitions were added to Rule 1111 to provide further clarification on rule applicability, compliance schedule, exemptions, and emission limits.

DUAL FUEL SYSTEM in paragraph (b)(4) is

> *"a heating, ventilation, and air conditioning system utilizing a HEAT PUMP as the primary source of heating and cooling with a FAN-TYPE CENTRAL FURNACE serving as auxiliary heating."*

HEAT PUMP in paragraph (b)(7)means

> *"an all-electric device that utilizes condensation and evaporation of refrigerant to absorb and release heat for heating, ventilation, and air conditioning applications."*

MOBILE HOME in paragraph (b)(8), which means:

> *"a prefabricated structure on a permanently attached chassis."*

MOBILE HOME FURNACE in paragraph (b)(9), which means:

> *"a furnace designed specifically and solely for installation to heat a mobile home."*

Rule 1111 Requirements (Subdivision(c))

Extending the mitigation fee alternative compliance option for weatherized units until September 30, 2021

When compared with condensing and non-condensing furnaces, weatherized furnaces utilize the same basic combustion technology for burner and heat exchanger design. The development work

for weatherized furnaces is focused on integration with the air conditioning unit as a package system, as well as addressing the outdoor operation environment.

To comply with the current Rule 1111, OEMs are paying the mitigation fee for weatherized furnaces distributed to the South Coast AQMD that are not meeting the 14 ng/J NOx emission limit. The mitigation fee alternative compliance option for this type of furnace will expire on September 30, 2020. OEMs, distributors, contractors, and installers would have to comply with the 14 ng/J NOx limit starting on October 1, 2020.

Multiple furnace manufacturers have reported delays in the supply chain, especially from overseas or Mexico, as a result of COVID-19. Other COVID-19 pandemic impacts include required lower worker density, plant-wide downtime to sanitize and prepare for worker distancing, and funding reallocation by corporate offices due to the unstable market and financial status. In addition, the OEMs are uncertain as to whether and how the COVID-19 pandemic will evolve to further adversely impacting their business. According to these OEMs, all these factors are contributing to the delay in furnace development and commercialization.

Out of the seven OEMs, three OEMs are expecting to have coverage for both commercial and residential weatherized models available that will meet the September 30, 2020 deadline, two OEM expect they will not meet the October deadline for either commercial or residential applications, and two OEMs have suspended any efforts to meet the deadline. Initial discussions with furnace OEMs suggested that bifurcating the weatherized category into single stage and three stage may provide a clear distinction between commercial and residential furnace applications. With continued discussions, some furnace OEMs agreed that bifurcating the weatherized category into single stage and three stage power would be a clear differentiation of the two applications while other OEMs disagreed with this approach stating that power phases does not properly represent the applications and associated supply chains. Based on continued discussions with the seven OEMs, PAR 1111 will not bifurcate the weatherized furnace category but will extend the mitigation fee alternative compliance option for all weatherized units by one year. The considerations are not only based on the COVID-19 impacts, but also the winter heating season which typically takes place from October to March and the summer cooling season which takes place from March to September. Implementing any new requirement in the middle of heating or cooling season would cause additional complications in the supply chain. This proposal does not change the requirements for the mitigation fee or the recordkeeping and reporting requirements. That is, the OEMS would continue to be subject to the phase two mitigation fee identified under Rule 1111 Table 2, as well as the compliance plan and report specified under Rule 1111(c)(5), except that the phase two mitigation fee option end date would be September 30, 2021 for weatherized units. The extension of the mitigation fee alternative compliance option outlined in Table 2 – Rule 1111 Table 2 – Alternate Compliance Plan with the Phase One and Phase Two Mitigation Fee Schedules until September 30, 2021 will also serve as a sell-through period to allow for greater flexibility on existing inventory of 40 ng/J NOx furnace.

Table 2 – Rule 1111 Table 2 – Alternate Compliance Plan with the Phase One and Phase Two Mitigation Fee Schedules

Furnace		Phase One Mitigation Fee		Phase Two Mitigation Fee		
Size Range	**Furnace Category**	**Phase One Mitigation Fee Start Date**	**Phase One Mitigation Fee ($/Unit)**	**Phase Two Mitigation Fee Start Date**	**Phase Two Mitigation Fee ($/Unit)**	**Phase Two Mitigation Fee Option End Date**
≤ 60,000 BTU/hr	Condensing	May 1, 2018	$275	October 1, 2018	$350	September 30, 2019
	Non-condensing	October 1, 2018	$225	April 1, 2019	$300	September 30, 2019
	Weatherized	October 1, 2018	$225	April 1, 2019	$300	**September 30, 2021** ~~**September 30, 2020**~~
	Mobile Home	October 1, 2018	$150	April 1, 2019	$150	September 30, 2021
> 60,000 Btu/hr and ≤ 90,000 BTU/hr	Condensing	May 1, 2018	$300	October 1, 2018	$400	September 30, 2019
	Non-condensing	October 1, 2018	$250	April 1, 2019	$350	September 30, 2019
	Weatherized	October 1, 2018	$250	April 1, 2019	$350	**September 30, 2021** ~~**September 30, 2020**~~
	Mobile Home	October 1, 2018	$150	April 1, 2019	$150	September 30, 2021
> 90,000 BTU/hr	Condensing	May 1, 2018	$325	October 1, 2018	$450	September 30, 2019
	Non-condensing	October 1, 2018	$275	April 1, 2019	$400	September 30, 2019
	Weatherized	October 1, 2018	$275	April 1, 2019	$400	**September 30, 2021** ~~**September 30, 2020**~~
	Mobile Home	October 1, 2018	$150	April 1, 2019	$150	September 30, 2021

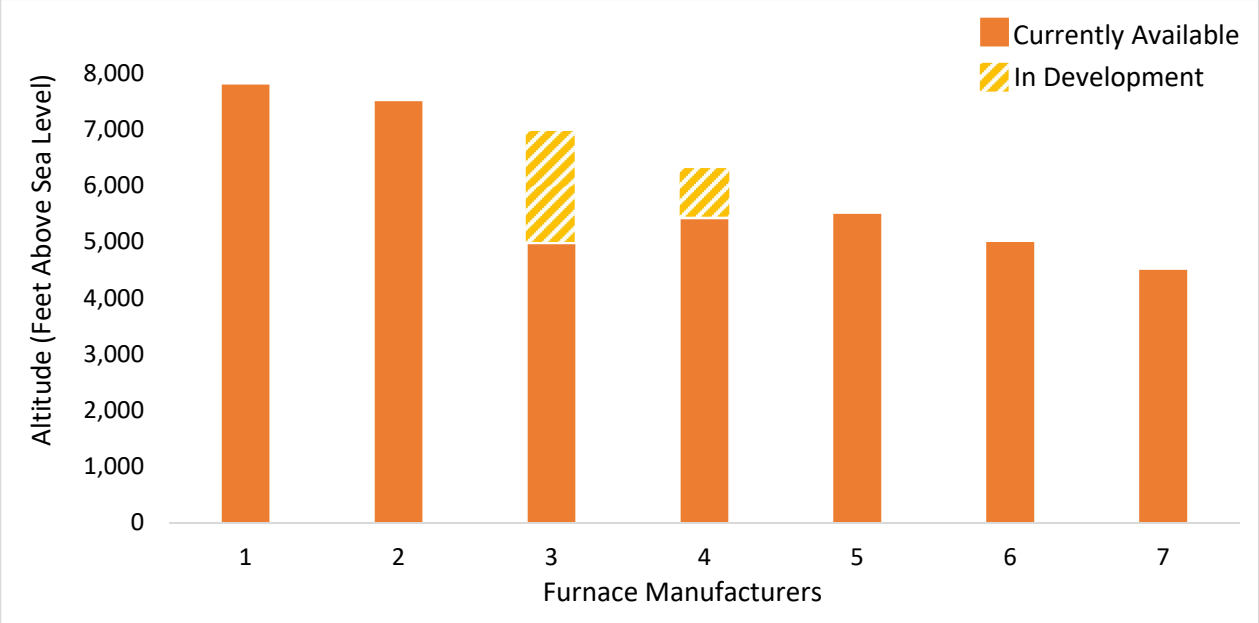
Rule 1111 Exemptions (Subdivision(g))

Extending the exemption for installing condensing and non-condensing furnace at high altitude until September 30, 2021

The furnaces at high altitude installations are mostly non-condensing and condensing furnaces. For an installation at high altitude, minor modification to the furnace are needed to accommodate different air density and oxygen levels to ensure an optimal air/fuel ratio for burner combustion. The modification involves a high-altitude kit or a built-in manifold adjustment on the 14 ng/J furnace. OEMs conduct high-altitude testing at specific types of facilities. Due to COVID-19, some OEMs had restrictions on non-essential travel and needed to suspend testing their units at high altitude facility.

Currently only two furnace manufacturers have completed high altitude testing for 14 ng/J condensing and non-condensing furnaces available for installations at around 6,800 feet above sea level or higher. Two additional OEMs were delayed due to company travel restrictions from COVID. Progress of high-altitude condensing and non-condensing furnace development is outlined in Figure 1.

Figure 1 – Development Status of High-Altitude Condensing and Non-Condensing Furnaces



Like the extension for weatherized units, the considerations include COVID-19 impacts as well as the winter heating season and summer cooling season duration. PAR 1111 paragraph (g)(5) will extend the exemption for high altitude installations by one year as follows:

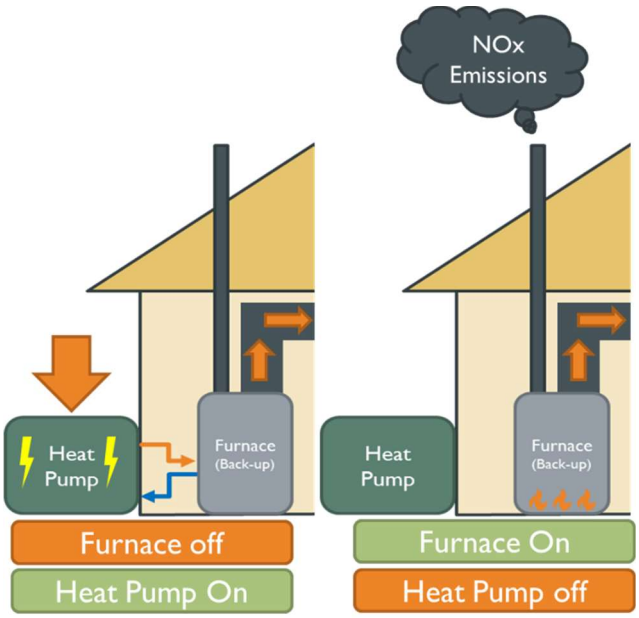
> *"(5) Condensing and non-condensing natural gas furnaces installed at elevations greater than or equal to 4,200 feet above sea level are exempt from paragraph (c)(4) until September 30, 2021. "*

Recordkeeping and reporting requirements specified under Rule 1111 paragraphs (g)(7), (g)(8), and (g)(9) will continue to apply.

Considerations of dual fuel split systems with 40 ng/J NOx furnace

Three OEMs and AHRI urged the South Coast AQMD staff to consider the dual fuel split system with a 40 ng/J noncompliant furnace as an option to comply with the Rule 1111 NOx limit. These OEMs have commented that a dual fuel split system with a 40 ng/J furnace would provide more compliance options for the consumer than a standalone 14 ng/J furnace. A dual fuel split system, also called hybrid system, is a heat pump paired with a gas furnace that provides both cooling and heating as depicted in Figure 2. Dual fuel split systems are comprised of a separate furnace and heat pump which are paired together by the installer or dealer as compared to a packaged weatherized dual fuel system where the system is packaged in a single enclosure. The heat pump operates as the primary heating source at milder temperatures with low heating demand. As temperatures get colder such as below 32°F, the heat pump does not have the capacity to keep the home warm. At this point the furnace then takes over as the auxiliary heating source, at what is called the "switchover temperature."

Figure 2 – Dual Fuel Heating System



According to the first OEM to propose this compliance option, the basis for installing a dual fuel split system would be significantly more NOx emissions reductions as compared to the operation of a 14 ng/J furnace. The OEM initially stated that there would be up to a 90 percent reduction in NOx emissions for installations in the South Coast AQMD using a dual fuel split system when compared to a 40 ng/J low NOx furnace on its own could be achieved. Based on a study that was funded by Trane Technologies and conducted by University of California, Davis, potential NOx emissions reductions can be up to 95-100 percent in high population areas of California when using a heat pump with a low NOx furnace (40 ng/J) for auxiliary heat vs. a standalone ultra-low NOx (14 ng/J) furnace. Based on a switchover temperature of 32 °F, the study concluded that most of the Southern California region could rely solely on the electric heat pump, thus generating fewer NOx emissions compared to the compliant standalone 14 ng/J NOx furnace. The emissions benefits from noncompliant 40 ng/J NOx dual fuel split systems start to decline relative to the length of operation of the furnace itself. To ensure the potential emissions reduction benefits from dual fuel system equipped with a noncompliant 40 ng/J NOx furnace, enforcement of furnace operation times (hours) would be necessary.

Staff discussed this subject with all seven OEMs and some distributors. Three OEMs oppose the allowance of dual fuel split systems with 40 ng/J furnaces because the 40 ng/J dual fuel system undercuts their development and commercialization of 14 ng/J compliant furnaces. These OEMs have expressed that they have invested significant resources to commercialize a complete portfolio of compliant furnaces and changing the requirements well after the 14 ng/J standard has been in

effect is a concern. They have also expressed concerns about the enforceability of allowing noncompliant furnaces to enter the basin because the furnace is sold as a split system and separate from the heat pump.

It is important to note that all seven furnace manufacturers have dual fuel split systems pairing a heat pump with compliant 14 ng/J NOx furnaces available. OEMs are also on schedule to certify their compliant furnaces for high altitude installations. Thus, compliant furnaces with 14 ng/J NOx emissions could be employed as part of the dual fuel split systems. Because compliant furnaces are available or actively under development, allowing noncompliant furnaces as part of dual fuel split systems would undercut the cost of existing dual fuel split systems that include compliant 14 ng/J furnaces and likely discourage new technology development, preventing or delaying further emissions reductions.

Furthermore, staff has concerns regarding the increased supply of 40 ng/J NOx furnaces in the South Coast AQMD to be used in dual fuel split systems, which could create additional enforcement challenges. With this legal pathway for stock to enter the District, noncompliant 40 ng/J NOx furnaces could be more accessible to be sold in standalone applications. In addition, the current design of the systems allows installers or consumers to be able to change the "switchover temperature" setting through the system control panel. Thus, an installation of a dual fuel system with a 40 ng/J NOx furnace could allow the noncompliant furnace to be run considerably more than what is assumed in the estimates that show emissions reductions and could result in significantly higher emissions than a compliant 14 ng/J furnace.

Lastly, the high reduction potential for NOx emissions (90 percent or higher) by using the dual fuel system as stated by the OEM is from the operation of the heat pump, not from the natural gas furnace within the system. According to the United States Energy Information Administration, the average California residential natural gas cost of $13.69/MSCF and residential electricity cost of $0.21/kwh as of March 2020. Assuming the Heat Seasonal Performance Factor (HSPF) for heat pumps to be between 7.1 to 10.2, heat pumps would cost between 33 to 53 percent more per BTU of heat generated compared to natural gas furnaces. This cost differential would create a financial incentive for homeowners to utilize gas furnaces over electric heat pumps in dual fuel systems. Using a compliant furnace instead of a noncompliant furnace would achieve an additional 65% emission reductions and not require staff inspection of the dual fuel system, risk user interference that would negate any emissions benefits, or open the door to noncompliant furnaces entering the District.

Staff acknowledges the emissions reduction benefits of dual fuel split systems; however, systems equipped with noncompliant 40 ng/J furnaces will undercut the cost of existing dual fuel split systems equipped with compliant 14 ng/J NOx furnaces as well as introduce additional compliance challenges that require regulating the end user. Dual fuel split systems with compliant 14 ng/J NOx furnaces offer the highest amount of emission reductions outside of standalone electric heat pump systems. On those bases, staff supports dual fuel systems using compliant 14 ng/J NOx furnaces but recognizes a dual fuel system with a 40 ng/J furnace has the potential, if designed properly, to generate lower NOx emissions than a standalone 14 ng/J furnace.

Exception for high altitude installations of dual fuel systems with 40 ng/J furnaces until September 30, 2022

Based on continued discussions with furnace OEMs and furnace installer representatives for communities located at high elevations, PAR 1111 paragraph (g)(6) will include an exemption for dual fuel systems with noncompliant 40 ng/J NOx furnaces for installation above 4,200 feet above sea level until September 30, 2022, as follows:

> *"(6) Effective October 1, 2021 and until September 30, 2022, a manufacturer, distributor, or installer that manufactures, supplies, sells, offers for sale, or installs a natural gas furnace certified to meet 40 ng/J of NOx that is installed and operated as part of a dual fuel system at or above 4,200 feet above sea level in the South Coast AQMD, shall only install such a unit that:*
>
> *(A) Is designed by the manufacturer with a system switchover point between heat pump and furnace at the external temperature of 32°F with a nonadjustable system that would prevent any person from changing the external ambient switchover temperature of 32°F;*
>
> *(B) Includes installation of an external temperature sensor which acts as the sole method to determine switchover point;*
>
> *(C) For systems equipped with condensing, noncondensing, or mobile home furnaces, includes communicating technology between the heat pump and furnace installed at the point of manufacture to prevent system operation without a heat pump and requires operations of only the heat pump at and above the switchover temperature outlined in (g)(6)(A); and*
>
> *(D) The shipping carton or the name plate of the furnace clearly displays: "This furnace must be installed only in a dual fuel configuration with an electric heat pump. Installation of this furnace without a heat pump in a dual fuel configuration will be a violation of South Coast AQMD Rule 1111."*

Considerations include the need for additional consumer options for high altitude areas due to development delays of COVID-19, the emission reduction potential of dual fuel systems, and the number of systems expected to be sold in the area. Manufacturers, suppliers and installers of these systems will need to comply with recordkeeping requirements in line with requirements for the existing Rule 1111 high altitude exemption. PAR 1111 will also require additional labeling and system design requirements to ensure proper operation of the dual fuel system with noncompliant 40 ng/J NOx furnaces by prioritizing heat pump operation and lockout of switchover temperature settings at the point of manufacture with required external temperature sensor installed with every system specified in Rule 1111(g)(6).

Recordkeeping and reporting requirements specified under Rule 1111 paragraphs (g)(7), (g)(8), and (g)(9) will also apply to this exemption with additional requirements added to maintain records of associated heat pumps sold as follows:

"(7) The manufacturer of any furnace that elects to use the exemption in paragraph (g)(4), (g)(5) or (g)(6) shall record the following information and shall make this information available upon request to the Executive Officer:

(A) Sales date to distributor;

(B) Distributor's name and full contact information (address and phone number);

(C) Model number of the furnace and heat pump (if applicable); and

(D) Serial number of the furnace and heat pump (if applicable).

(8) The distributor that elects to use the exemption in paragraph (g)(4), (g)(5) or (g)(6) shall record the following information and shall make this information available upon request to the Executive Officer:

(A) Sales date to installer;

(B) Installer's name and full contact information (address and phone number);

(C) Model number of the furnace and heat pump (if applicable); and

(D) Serial number of the furnace and heat pump (if applicable).

(9) The installer that elects to use the exemption in paragraph (g)(4), (g)(5) or (g)(6) shall record the following information and shall make this information available upon request to the Executive Officer:

(A) Installation date;

(B) Address of furnace installation;

(C) Model number of the furnace and heat pump (if applicable); and

(D) Serial number of the furnace and heat pump (if applicable)."

Additional Recordkeeping for Propane Exemption

Staff is including furnaces being sold under exemption in paragraph (g)(4) into recordkeeping requirements in paragraph (g)(7), (g)(8), and (g)(9) to maintain the original requirements and strengthen enforceability of the reporting requirements of the exemption once the mitigation fee period ends.

Expanded Rebate Program to End Users

As of April 28, 2020, the initial funding allocation of $3,000,000 approved by the South Coast AQMD Governing Board on December 17, 2017 to the Rule 1111 furnace consumer rebate program was exhausted. As part of the initial rebate approved by the Board allowed for the additional fees collected by the incremental mitigation fee increase from the March 2, 2018 rule

amendment to be used for consumer rebates of $300 per unit for condensing furnaces and $200 per unit for noncondensing, weatherized, and mobile home furnaces. Staff estimates the total funding collected from the incremental mitigation fee increase to be about $4,600,000.

Through discussions with furnace manufacturers, additional technologies to further reduce NOx emissions were introduced to staff in the form of gas-electric hybrid dual fuel split systems and electric heat pump systems. Staff agrees that dual fuel split systems with a compliant 14 ng/J furnaces as well as pure electric heat pump systems can provide greater reductions of NOx than a standalone furnace. Dual fuel split systems and electric heat pump systems are generally costlier when compared to conventional standalone furnace and air conditioner HVAC systems. Incentivizing these new equipment categories will further advance the South Coast AQMD mission to further reduce NOx emissions in the region.

To incentivize early adoption of compliant 14 ng/J furnaces for weatherized and mobile home furnaces as well as furnaces for high altitude applications and alternative heating technologies, staff proposes to include additional funding not to exceed $3,000,000 into the Rule 1111 rebate program and modify the existing rebate amount as follows:

Category	Original Rebate	New Rebate	Applicability
Condensing	$500 for first the 6,000; $300 thereafter	$500	Compliant 14 ng/J NOx furnace installed at or above 4,200 Feet Above Sea Level
Non-condensing	$500 for first 6,000; $200 thereafter	$500	Compliant 14 ng/J NOx furnace installed at or above 4,200 Feet Above Sea Level
Weatherized	$200	$500	Compliant 14 ng/J NOx furnace installed within the South Coast AQMD
Dual Fuel Split Systems	-	$500	Gas-electric dual fuel heating system with compliant 14 ng/J NOx furnace installed within the South Coast AQMD
Electric Heat Pumps	-	$1,000	Full electric central HVAC system installed within the South Coast AQMD

Proposed additional rebate funding amount will be divided among the equipment categories and adjusted according to observed demand. Rebates for weatherized, mobile home, high altitude condensing, and high altitude non-condensing furnaces will end on September 30, 2021 and any remaining funds will be reallocated for dual fuel systems with compliant 14 ng/J furnaces and electric heat pump systems. Rebates to compliant 14 ng/J dual fuel split systems and electric heat pump systems will conclude once rebate funds are exhausted.

CHAPTER 3: IMPACT ASSESSMENT

DELAY OF EMISSION REDUCTIONS

Based on the 2016 AQMP emission inventory for fuel consumption, the annual average NOx emissions from residential heating using natural gas was 9.51 tons per day in 2012. Staff estimates that there are about four million residential type heating furnaces in the South Coast AQMD. Based on a furnace life of 25 years, a typical furnace emits 1.5 to 2.0 pounds of NOx per year. The emission rate reduction from 40 ng/J to 14 ng/J results in more than one pound per year of NOx emissions reductions for each furnace.

Total weatherized furnace annual sales are estimated at 15,000 units in the South Coast AQMD. A one-year delay in compliance would result in about 0.026 tons per day emission reduction delay for the next 25 years [calculated as: (15,000 x (2 x 0.65))/(2,000x365)].

Staff tracked furnace sales to be approximately 50 units for high altitude installations during the two-month period of October and November 2019. Based on this information, the estimated total installations during the six-month exemption extension would be between 200 and 400 units. The one-year extension of the exemption for high altitude installations would result in a negligible (near zero tons per day) emission reduction delay. Assuming a dual fuel system with noncompliant 40 ng/J NOx furnace operates less than 35% than a standalone 14 ng/J furnace and the dual fuel system has the appropriate switchover temperature that cannot be modified, no emissions forgone are expected with a dual fuel system with a noncompliant 40 ng/J furnace as compared to a standalone compliant 14 ng/J furnace.

Consequently, the emission reduction delay by this proposal is not significant. The proposed amendments do not result in any significant effect on air quality or significant changes to emissions reductions.

On the other hand, the final year (2046, based on a 25-year useful life expectancy) to achieve the overall emission reductions for this rule remains unchanged, as the proposed compliance date of September 30, 2021 for both weatherized units and high-altitude installation is still consistent with the mobile home furnace compliance date of October 1, 2021.

COST EFFECTIVENESS

A cost effectiveness analysis is not required for PAR 1111. The proposed amendment does not impose additional requirements on manufacturers of compliant residential furnaces meeting the 14 ng/J NOx emission limit.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) ANALYSIS

Pursuant to the California Environmental Quality Act (CEQA), South Coast AQMD, as Lead Agency, has reviewed the proposed project pursuant to: 1) CEQA Guidelines Section 15002(k) – General Concepts, the three-step process for deciding which document to prepare for a project subject to CEQA; and 2) CEQA Guidelines Section 15061 – Review for Exemption, procedures for determining if a project is exempt from CEQA. Since the proposed project would result in minimal and temporary forgone NOx emission reductions, it can be seen with certainty there that there is no possibility that the proposed project may have a significant adverse effect on the

environment. Therefore, the project is exempt from CEQA pursuant to CEQA Guidelines Section 15061(b)(3) – Common Sense Exemption. If the proposed project is approved, the Notice of Exemption will be filed with the county clerks of Los Angeles, Orange, Riverside, and San Bernardino counties. In addition, the Notice of Exemption will be electronically filed with the State Clearinghouse to be posted on their CEQAnet Web Portal, which may be accessed via the following weblink: https://ceqanet.opr.ca.gov/search/recent.

SOCIOECONOMIC IMPACT ASSESSMENT

The proposed amendments to Rule 1111 does not impose any additional requirements and will have no adverse socioeconomic impacts. The consumer rebate provides an incentive to install 14 ng/J weatherized and furnaces in high altitude areas before the end of the mitigation fee and compliance dates. In addition, for homeowners that elect to install a 14 ng/J dual fuel split system, or an all-electric heat pump system will be eligible for a $500 and $1,000 rebate, respectively.

DRAFT FINDINGS UNDER CALIFORNIA HEALTH AND SAFETY CODE SECTION 40727

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. In order to determine compliance with section 40727, 40727.2 requires a written analysis comparing the proposed amended rule with existing regulations, if the rule meets certain requirements.

The following provides the draft findings.

Necessity: A need exists to amend Rule 1111 to provide extension to both the mitigation fee alternative compliance option for weatherized units and the exemption for installing condensing and non-condensing furnaces at high altitude areas to ensure there are sufficient units available to the consumer.

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

Clarity: PAR 1111 has been written or displayed so that its meaning can be easily understood by the persons affected by the rule.

Consistency: PAR 1111 is in harmony with, and not in conflict with or contradictory to, existing federal or state statutes, court decisions, or federal regulations.

Non-Duplication: PAR 1111 does not impose the same requirement as any existing state or federal regulation and is necessary and proper to execute the powers and duties granted to, and imposed upon, the South Coast AQMD.

Reference: In amending this rule, the South Coast AQMD hereby implements, interprets, or makes specific reference to the following statues: Health and Safety Code sections 39002, 40001, 40702, 40440(a), and 40725 through 40728.5.

INCREMENTAL COST-EFFECTIVENESS

Health and Safety Code section 40920.6 requires an incremental cost-effectiveness analysis for Best Available Retrofit Control Technology (BARCT) rules or emission reduction strategies when there is more than one control option that would achieve the emission reduction objective of the proposed amendments, relative to ozone, CO, SOx, NOx, and their precursors. The proposed amendment does not include new BARCT requirements; therefore, this provision does not apply to the proposed amendment.

COMPARATIVE ANALYSIS

Health & Safety Code section 40727.2(g) for comparative analysis is applicable when the proposed amended rules or regulations impose, or have the potential to impose, a new emissions limit or standard, or increased monitoring, recordkeeping, or reporting requirements. In this case, a comparative analysis is not required because the amendments do not impose such requirements.

REFERENCES

REFERENCES

South Coast CAQMD, 2009. *Staff Report: Proposed Amended Rule 1111 – NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces*. South Coast Air Quality Management District, November 2009.

South Coast AQMD, 2014. *Rule 1111 Technology Assessment for Residential Furnaces*. South Coast Air Quality Management District, January 2014.

South Coast AQMD, 2014. *Staff Report: Proposed Amended Rule 1111 – NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces*. South Coast Air Quality Management District, September 2014.

South Coast AQMD, 2017. *Final 2016 Air Quality Management Plan.* South Coast Air Quality Management District, March 2017.

South Coast AQMD, March 2018. *Staff Report: Proposed Amended Rule 1111 – NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces*. South Coast Air Quality Management District, September 2014.

South Coast AQMD, March 2018. *Board letter: Execute Contract to Implement Consumer Rebate Program for Rule 1111 Compliant Natural Gas-Fired, Fan-Type Central Furnaces*

South Coast AQMD, December 2019. *Board letter: Determine That Proposed Amendments to Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces, Are Exempt from CEQA and Amend Rule 1111*

Dichter, Nelson. 2020. *Report WCEC 2020-01: Analysis of NOx Emissions Hybrid Heating Technologies in California.* University of California, Davis Western Cooling Efficiency Center

RESPONSE TO COMMENTS

July 2020

RESPONSE TO COMMENTS

South Coast AQMD staff held a public workshop on July 15, 2020 via Zoom video conference. Six comments were received during the public workshop, and one comment letter was received prior to end of comment period on July 24, 2020. The following responses summarize the key comments received during the public workshop:

High Altitude Installations

Comment WS-1: Furnace manufacturers have yet to provide guidance on product offerings available for high altitude installations.

Response WS-1: At the Working Group Meeting and Public Workshop, staff encouraged furnace manufacturers to reach out to installers regarding their product offerings for high altitude installations. Staff treats the discussions with OEMs regarding the status of commercialization of specific products as business confidential information. OEMs may also share commercialization status more generally, but not identify specific models and release dates. At this point, staff is aware that two furnace manufacturers are currently able to provide compliant condensing and non-condensing furnaces for installations up to around 6,800 feet above sea level or higher for communities within the South Coast AQMD, such as Big Bear City, with an additional furnace OEM expected to have units available at that elevation by October 1, 2020. To provide additional time for furnace manufacturers to develop high altitude kits and guidance for compliant 14 ng/J furnaces, staff is proposing to delay the compliance date for high altitude furnace installations one year to September 30, 2021, while maintaining existing recordkeeping requirements for the manufacturer, distributor, and installer. Staff is also proposing to offer rebates for compliant furnaces installed in high altitude areas to incentivize early adoption of compliant units prior to the September 30, 2021 compliance date.

Weatherized Furnaces

Comment WS-2: A sell-through provision should be provided for existing inventory of non-compliant weatherized furnaces beyond the end of the extended mitigation fee period.

Response WS-2: Based on continued discussions with the furnace manufacturers, PAR 1111 will extend the mitigation fee alternative compliance option for all weatherized units by one year to September 30, 2021, an additional six months from the original proposed date of March 30, 2021. The considerations are not only based on the COVID-19 impacts, but also the winter heating season which typically takes place from October to March and the summer cooling season which takes place from March to

September. Staff believed that the additional six months will provide extra flexibility for manufacturers and distributors to manage existing inventory by allowing companies to set their own compliance date tailored to their unique situations. Because the mitigation fee would still apply during a sell through period, the impact of extending the mitigation fee alternative compliance option is the same, but the proposed amendments provide the additional benefits of greater flexibility for inventory management.

Dual Fuel Systems with Noncompliant 40 ng/J Furnaces

Comment WS-3: Dual fuel systems with noncompliant 40 ng/J furnaces should be available as an alternative compliance option to all areas within the South Coast AQMD jurisdiction.

Response WS-3: PAR 1111 will include an exemption for dual fuel systems with noncompliant 40 ng/J NOx furnaces for installations above 4,200 feet above sea level until September 30, 2022 to provide additional consumer options for high altitude areas. Manufacturers, distributors, and installers of these systems will need to comply with the same recordkeeping requirements for standalone noncompliant furnaces that are installed in high altitude areas through September 30, 2021. PAR 1111 will also require additional labeling and system design requirements to ensure proper operation of the dual fuel system with a noncompliant 40 ng/J NOx furnace by prioritizing heat pump operation and lockout of switchover temperature settings at the point of manufacture with a required external temperature sensor installed with every system. Staff is also proposing to offer rebates for dual fuel systems with compliant 14 ng/J furnaces to support alternative low emission technologies.

Comment Letter #1:

AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better®

2311 Wilson Boulevard Suite 400 Arlington VA 22201 USA
Phone 703 524 8800 | Fax 703 562 1942
www.ahrinet.org

Comment Letter #1

July 9, 2020

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

Re: AHRI Comments on Proposed Revisions to South Coast Air Quality Management District Rule 1111

Dear Mr. Wang:

This letter is submitted in response to the proposed revisions to the South Coast Air Quality Management District's proposed revisions to Rule 1111 to reduce NOx emissions from natural-gas-fired, fan-type central furnaces.

The Air-Conditioning, Heating and Refrigeration Institute (AHRI) represents 332 air-conditioning, heating, and refrigeration equipment manufacturers. In North America, the annual output of the HVACR and water heating industry is worth more than $44 billion. In the United States, the industry supports 1.3 million jobs and $256 billion in economic activity annually. AHRI represents the vast majority of the furnace manufacturers selling products in the United States. 1-1

AHRI appreciates South Coast Air Quality Management District's (SCAQMD) staff consideration in extending the compliance date for Rule 1111 due in part to the unprecedented circumstances surrounding the COVID-19 pandemic and resulting shelter-in-place orders issued around the country and world.

The original compliance date of October 1, 2020 was originally chosen because most furnaces are installed as part of an air-conditioning package during the Spring and Summer months. Therefore, AHRI respectfully requests that the SCAQMD staff considers extending the mitigation period to October 1, 2021 to minimize any disruptions to the seasonal supply chain. 1-2

AHRI also requests that SCAQMD staff consider including a sell-through period of 6-months to allow wholesalers and contractors to use the appliances they currently have in stock. Heating and cooling appliances are ordered in bulk at least 90 days prior to the intended installation date. Additionally, construction projects designed and approved prior to the enforcement date include existing appliance types and would potentially require redesign of the building. 1-3

AHRI's last request is for SCAQMD to consider the use of dual-fuel systems incorporating a gas-fired furnace rated at 40 ng/J and a heat-pump furnace to meet emission requirements. There is a limited number of Ultra-low NOx furnaces currently available in the marketplace and mandating their installation now would add an unnecessary cost burden for the consumer. AHRI believes that a duel-fuel system will enable the SCAQMD to attain its goal in reducing emissions while providing consumers with product choice and comfort. 1-4

AHRI appreciates the opportunity to provide these comments. If you have any questions regarding this submission, please do not hesitate to contact me at (703) 293-4864 or SCorcoran@AHRInet.org.

Sincerely,

Shannon M. Corcoran
Lead Advisor, Regulatory Affairs for Heating Technologies

Response to Comment Letter #1

Response 1-1: Thank you for your comments and ongoing participation in the amendments to Rule 1111.

Response 1-2: We recognize the concern with a compliance date at the end of the heating season. PAR 1111 has been revised to provide the additional time needed and extend the compliance date to September 30, 2021

Response 1-3: Staff initially recommended to extend the mitigation fee period for weatherized furnaces six months to March 31, 2021, but later revised the recommendation to extend it one year to September 30, 2021. Staff believes that the additional six months serves as a sell-through period that provides additional flexibility to manage existing inventory by allowing companies to set their own compliance date tailored to each company's unique situations

Response 1-4: Staff's proposal provides for the installation of dual fuel HVAC systems with 40 ng/J furnaces in high altitude areas with conditions to ensure these systems operate in configurations that implement proper "anti-override" technologies. Staff will also conduct periodic "check-ins" to ensure the program is working effectively.

Comment Letter #2:

Comment Letter #2

Shawn Wang

From: Chris M Forth <chris.m.forth@jci.com>
Sent: Friday, June 19, 2020 7:01 AM
To: Shawn Wang; Susan Nakamura; Michael Krause; Gary Quinn; Yanrong Zhu
Cc: Doug McLeish; David Stephens
Subject: Johnson Controls Rule 1111 Positions

To South Coast Staff and Board Members:

Thank you for the recent discussions on this topics. The below is offered to help clarify JCI's positions regarding the upcoming Rule 1111 update.

Please let us know if you have any questions.

Chris M Forth
Executive Director
Regulatory, Codes & Environmental Affairs
Johnson Controls
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JCI Rule 1111 Positions

Non-weatherized, High Altitude (Residential Split Furnace)

- While we / JCI are supportive of the AHRI / industry position to request additional time due to COVID impacts we are good with the current September 30, 2020 date. 2-1

Weatherized ULNx, Residential (Single Packaged Unit – primarily 1 ph)

- If the sector is going to be separated between residential and commercial, we are good with the current September 30, 2020 date. If the sectors are not going to be split then we agree with the AHRI / Industry position to support a 1 year delay to September 30, 2021.

Weatherized ULNx, Commercial (Rooftop, Single Package Unit- primarily 3 ph)

- If the sector is going to be separated, we / JCI agree with the AHRI / Industry position of a 1 year delay to Sept 30th, 2021. While the current 6 month delay to April 1, 2021 is appreciated, the April timeframe still falls within the industry busy season (April – Sept) where manufacturers and distributors are building and pre-loading inventory in anticipation of the summer peak which cannot be filled as orders come in; the demand is simply too great for any manufacturer to "build to order". As previously agreed to by all OEM's, an October transition is the least disruptive to all stakeholders. Because of the change in the heating system we are better off with the October date. The units will be run in the "heating "mode shortly after being installed (if there are field issues they will surface and get addressed), instead of starting sales going into the cooling season where they will may not be noticed for several months. 2-2
    - We / JCI also need additional time to develop a new, packed, 40 Ng/J dual fuel offering which we do not have in our product portfolio today; 6 months is simply not enough time for the required product development process to work in the current COVID situation which continue to impact our operations.
- We / JCI agree with distributions' request for at least a brief 90 day sell through to avoid stranding inventory in the channel as commercial jobs have longer lead times and require specific models to align with roughed in

curbs. In the replacement market existing ductwork and curbs which comprises the majority of the jobs in the commercial market.

- Please note that JCI will not be building additional, 40 Ng/J inventory during this period; this request is simply to support distribution inventory sell through as the timing of individual sales is very hard to predict.

2-2 cont'd

Non-weatherized, Dual Fuel (Residential Split Furnaces)
Weatherized, Dual Fuel (Single Packaged Units)

- JCI supports the 40 Ng/J - Dual Fuel alternative for both non-weatherized and weatherized applications for the following reasons:
  - It will reduce overall NOx emissions compared to a standalone 14 Ng/J Ultra Low NOx furnace
  - It will increase consumer choice as there are significantly more models available in the market with the current 40 Ng/J Low NOx furnace from all OEM's versus the 14 Ng/J models which require a complete new, more complex technology.
  - It will improve overall market efficiency as several manufacturers including JCI do not have their high efficiency systems designed for with Ultra Low NOx operation (16 SEER packaged units, 20+ SEER split units and not available with the Ultra-Low NOx); the market demand is simply not great enough due to cost / price.
  - It will reduces consumer cost as the technology to achieve the 40 Ng/J threshold is far less expensive than the technology required to achieve the lower 14 Ng/J level.
- **Explanation**
  - Please note that JCI does not support the Hybrid proposal of a heat pump paired with an Ultra-Low NOx (14 Ng/J) furnace due to increased consumer cost (the design required to comply with a 14 Ng/J Ultra Low NOx furnace is simply more expensive than a 40 Ng/J) and less consumer choice as there will be far more models available in the market with the 40 Ng/J design.

2-3

  - Overall Energy efficiency has also been sacrificed as there are far fewer high efficiency models available with Ultra Low NOx versus the current 40 Ng/J models. Note that only 9% of available rebates went to non-weatherized furnaces as there are simply far fewer models available and the added cost/price deters consumer adoption. Several manufacturers including JCI do not offer the highest efficiency equipment in a Dual Fuel application due to technology challenges and cost issues of adding even more cost to an already premium priced system.

  - To Address South Coast Staff concerns regarding field adjustment of the balance point and inspector confusion with both 14 and 40 Ng/J furnaces in the market JCI offers the following comments:
    - There is technology available in the market that can prevent home owners from adjusting the balance point of a dual fuel system to ensure the heat pump operates the majority of operating hours versus the furnace. This can either be through thermostat's with password protection or diagnostic software provided by the manufacturer to the contractor. Access to this adjustment can be limited to trained service technicians familiar with the equipment. Future enhancements could include utility access to adjust the balance point setting similar to that which occurs today with cooling "demand shed", (energy savings) programs that consumers can "opt into".
    - A dual fuel system always includes a heat pump versus an air-conditioner. Contractors and installers clearly know the difference between a heat pump and an air-conditioner. Rule 1111 requires clear labeling of furnace NOx emission levels. Therefore inspectors can easily determine if there is a clearly marked 40 Ng/J furnace; it must be mated with a heat pump. Heat pumps are easily discernable from air-conditioning units by physical configuration, model numbers, literature / application data, etc. Several OEM's (including JCI) have QR / Bar codes on their equipment labeling which enables inspectors, installers, homeowners, etc. to quickly access available public information as to the equipment type. Thus JCI believes this is easily controlled.

- JCI also notes that California is a leader in the decarbonization and electrification initiative. As such, dual fuel applications support this effort and provide the lower cost alternative to a stand-alone heat pump with backup electric heat. Most of California's installed home base is comprised of older homes which were designed for use with gas heat thus retrofitting to a heat pump will often require additional electrical capacity increases. Often times this will include increasing the homes Amp service capacity from 100 amps to 150 ~ 200 amp service which can cost several thousand dollars (please confirm with electrical contractors). A dual fuel option will prevent the need for this costly increase and still support the decarbonization initiative and keep consumer cost low.

2-3 cont'd

Response to Comment Letter #2

Response 2-1: Thank you for your comment.

Response 2-2: Please see response to comment WS-2 regarding weatherized furnaces from the public workshop.

Response 2-3: Please see response to comment WS-3 regarding dual fuel systems with non-compliant 40 ng/J NOx furnaces from the public workshop.

Comment Letter #3

Comment Letter #3

Lennox International Inc.
2140 Lake Park Boulevard
Richardson, Texas 75080-2254

Mailing Address:
P.O. Box 799900
Dallas, Texas 75379-9900

Telephone: 972.497.6659
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LennoxInternational.com

Dave Winningham
Sr. Engineering Manager
Regulatory Affairs
Telephone: 803-738-4085

July 28, 2020

South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, California 91765

Submitted via: e-mail

Re: South Coast Air Quality Management District Rule 1111 Amendment Proposal

Lennox International Inc. (Lennox) is one of two American-based manufacturers who compete in the residential furnace market subject to Rule 1111. Lennox is a leading provider of climate control solutions for the heating, air-conditioning and refrigeration equipment markets (HVACR). Lennox has a long history of innovation leadership since our founding over 120 years ago in Marshalltown, Iowa. Lennox manufactures some of the most efficient and environmentally friendly products available while maintaining the levels of product safety and reliability required by the HVACR market.

Lennox has consistently supported the advancement of South Coast Air Quality Management District's ("SCAQMD") Rule 1111 which significantly reduces furnace NOx emissions. Lennox supports the continued progression of the Rule for weatherized and high-altitude furnace products but the impacts of the current COVID-19 pandemic and resulting economic hardship are causing delays in product development programs. Lennox supports the current SCAQMD Rule 1111 Amendment proposal as it allows for a rationale transition to compliant products ensuring adequate product availability and reasonable consumer cost.

A. Lennox supports the SCAQMD Rule 1111 Amendment as proposed. 3-1

The establishment of the 14 ng/jl limit for furnaces covered by Rule 1111 was finalized in November 2009. Lennox introduced the first commercially available SCAQMD Rule 1111 compliant furnaces in November 2017. Following this initial introduction Lennox has launched a complete range of compliant products that range from non-condensing furnaces to premium high efficiency condensing furnaces in configurations. This includes furnaces that match with our highest efficiency air conditioning and heat pump systems with variable capacity.

Lennox is continuing its commitment to expand its offering to include high altitude and weatherized products as well as to further expand its furnace offering. But due to obvious recent events caused by the COVID-19 pandemic these development efforts have been delayed. Lennox finds the current SCAQMD Amendment Proposal strikes the proper balance to allow for development of these products while incentivizing the transition to compliant products through the Clean Air Rebate program. Since our initial offering of compliant furnaces in late 2017 the volume of compliant products has consistently grown and offers future opportunity for investment to improve manufacturing productivity and consumer cost of these products.

The proposed extension of the mitigation period/compliance date for weatherized and high-altitude furnaces will ensure consumers have an adequate choice of products and a reasonable level of competition to ensure their interest are protected.

B. Lennox opposes further Rule 1111 Amendment proposals for dual fuel systems that allow continued use of non-compliant furnaces.

Further Amendment of Rule 1111 to allow non-compliant furnaces in dual fuel application is not aligned with the intent of the rule and disadvantage compliant furnace manufacturers. It will also cause further uncertainty in the market and perpetuate a cycle of resistance to low emission furnace technology by manufacturers, distributors and installers.

Lennox has spent millions of dollars in research and development investments and production capability to commercialize a technically feasible product and has paid millions in mitigation fees to comply with SCAQMD Rule 1111 regulations. During the ongoing Rule 1111 Amendment process Lennox consistently indicated that compliant manufacturers were being placed at a disadvantage in the market. While Lennox agrees that dual fuel systems can provide additional emission reductions, all Lennox compliant furnace can be used in dual fuel applications to provide additional reductions. SCAQMD efforts to incent dual fuel systems with compliant furnaces through the Clean Air Rebate program is the recommended approach and is well aligned with the objectives of Rule 1111 to reduce NOx emissions. 3-2

SCAQMD has correctly identified that further amendment of the rule for non-compliant dual fuel systems will open potential loopholes and create unnecessary enforcement issues regarding non-compliant furnaces and should not be considered in the current Rule Amendment.

C. Clean Air Rebate Program

Lennox supports the SCAQMD recommendation for the Clean Air Rebate Program to incentivize compliant weatherized, high altitude and dual fuel systems. While our current development for weatherized and high-altitude furnaces has been delayed, we support rewarding compliant product in these as well as dual fuel applications. 3-3

D. Summary

In summary Lennox supports the work of SCAQMD to move forward with the current Rule 1111 Amendment as proposed. Lennox has upheld its commitment to support Rule 1111 with its resulting significant reduction in NOx emission to help SCAMQD achieve its air quality objectives and finds that further amendment for non-compliant dual fuel systems will disadvantage manufacturers who have invested heavily in compliant products. 3-4

Sincerely,

David Winningham

Dave Winningham,
Sr. Engineering Manager, Regulatory Affairs

Response to Comment Letter #3

Response 3-1: Staff acknowledges the work Lennox has conducted over the past years to achieve low NOx furnaces and appreciates both your comments and ongoing participation in the rule development process.

Response 3-2: Staff's current proposal will allow for dual fuel systems with non-compliant 40 ng/J furnaces to be installed at elevations at or above 4,200 feet until September 30, 2022. As stated in Response 1-4, conditions will be imposed on the systems sold under this exemption and staff will conduct periodic updates of the supply chain to ensure proper implementation.

Response 3-3: Staff appreciates the continued input the commenter provided toward revision of the Clean Air Furnace Rebate Program.

Response 3-4: Staff appreciates the commenter's support of the amendments to Rule 1111,

Comment Letter #4

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Comment Letter #4

July 28, 2020

Shawn Wang
Air Quality Specialist
South Coast Air Quality Management District
21865 Copely Drive
Diamond Bar, CA 91765

Re: PAR 1111: 30-Day Preview Version

Dear Mr. Wang,

We would like to submit the following comments regarding the most recent 30-Day Preview version of the PAR 1111. 4-1

- Currently, paragraph (g)(6)(A) lists a requirement of "an external ambient switchover temperature of 32°F with a nonadjustable system that would prevent any person from changing the external ambient switchover temperature of 32°F". We request that the mandated switchover temperature be adjusted to 40°F. Studies conducted by Trane Technologies and others have consistently shown the efficacy of dual fuel systems at 40°F, demonstrating a potential annual NOx reduction of 96%. 4-2

- Seeing as there are different methods to prevent switchover temperature tampering, the requirements listed in paragraphs (g)(6)(B) and (g)(6)(C) should be noted as an and/or statement.
  - Currently, the document indicates that both an external ambient temperature sensor ***and*** communicating technology need to be present in order for the system to be acceptable. The weatherized furnace solution proposed by Trane Technologies does not encompass communicating technology and relies solely on a nonadjustable, external ambient temperature sensor. This sensor and associated hard-wired software satisfy all of the requirements set in PAR 1111 without the use of communicating technology. Given this method of satisfying the PAR 1111 requirements, we propose that an and/or clause is adopted, or that weatherized and condensing and non-condensing requirements are listed separately. 4-3

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We are thankful for South Coast Air Quality Management District's (SCAQMD) continued dialog and coordination in regard to PAR 1111. We are confident that together we can work toward providing the best heating, ventilating, and air conditioning (HVAC) solutions that help limit Nitrous Oxide (NOx) and Carbon Dioxide (Co_2) emissions. Should you have any questions, please don't hesitate to contact us. 4-4

Best Regards,

Kellie Lindenmoyer

Kellie Lindenmoyer
Furnace Product Manager

Trane Technologies
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Response to Comment Letter #4

Response 4-1: Thank you for your comments on the amendments to Rule 1111.

Response 4-2: The switchover temperature for dual fuel systems referenced in the proposed amendments to Rule 1111 was based on a publicly available study conducted by University of California, Davis, and formally presented to staff and the Governing Board at last year's public hearing. That study demonstrated potential NOx emissions reductions of up to 95-100 percent in high population areas of California when using a heat pump with a low NOx furnace (40 ng/J) for auxiliary heat as compared to the emissions from the operation of a standalone ultra-low NOx (14 ng/J) furnace. One of the parameters of the study assumed a switchover temperature of 32 °F, and since most of the Southern California region do not typically drop to temperatures below 32°F, the study concluded this region could rely solely on the electric heat pump, thus generating fewer NOx emissions compared to the compliant standalone 14 ng/J NOx furnace. While the amendments support the use of dual fuel systems, the lower switchover temperature ensures more operation of the electric heat pump and emission reductions expectations as presented in the UC Davis study.

Response 4-3: Staff agrees with the commenter that weatherized dual fuel systems do not face the same challenges as split dual fuel systems that utilize condensing, noncondensing, or mobile home furnaces. As such PAR 1111 language does not require weatherized furnaces to include communicating technology for exemption (g)(6).

Response 4-4: Staff appreciates the commenter's ongoing participation and collaboration during the development of the amendments to Rule 1111.

Comment Letter #5

Comment Letter #5

July 31, 2020

Shawn Wang
Air Quality Specialist
South Coast Air Quality Management District
21865 Copely Drive
Diamond Bar, CA 91765

Re: PAR 1111: 30-Day Preview Version

Dear Mr. Wang,

Trane Technologies™ is a climate company with well-known brands such as Trane®, American Standard Heating and Air Conditioning® and Thermo King®, which are global leaders in stationary and transport air conditioning and transport refrigeration products. Trane Technologies is well-known for its global sustainability leadership in reducing emissions, where it reduced more than 35% of its operational GHG footprint and 50% of its product refrigerant GHG footprint between 2015 and 2020. Trane Technologies has also committed to having a carbon neutral footprint and reducing our customers' emissions by one gigaton (1 billion metric tonnes) CO_2e by 2030.

It is with these commitments in mind that we would like to submit the following comments regarding the most recent 30-Day Preview version of the PAR 1111. We will first address our issues with the specific proposed language, and then discuss our request for general dual fuel application. 5-1

Paragraph (g)(6)(A) lists a requirement of "an external ambient switchover temperature of 32°F with a nonadjustable system that would prevent any person from changing the external ambient switchover temperature of 32°F". We request that the mandated switchover temperature be adjusted to 40°F. Studies conducted by Trane Technologies and others have consistently shown the efficacy of dual fuel systems at 40°F, demonstrating a potential annual NOx reduction of 96%.

- Paragraph g(6) only allows for low NOx furnace (40 ng/J) dual fuel systems that have both an external ambient temperature sensor ***and*** communicating technology. However, the weatherized furnace solution proposed by Trane Technologies does not include communicating technology and relies solely on a

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nonadjustable, external ambient temperature sensor. This sensor and associated hard-wired software satisfy all of the requirements set in PAR 1111 without the use of communicating technology. As such, we propose clarifying this issue as suggested below. 5-1 (cont'd)

- Paragraph g(6) only allows for low NOx dual fuel systems at altitudes at or above 4,200 feet above sea level. However, given that Trane Technologies and other manufacturers have definitively demonstrated how weatherized units and communicating condensing and non-condensing dual fuel systems will include adequate safeguards to prevent installers, distributors and homeowners from tampering with the furnace and heat pump configuration and programming, **low NOx dual fuel systems should be allowed at all altitudes for weatherized units and communicating systems** as suggested below. We have presented the following solutions:
    - Weatherized solution:
        - Weatherized units, also known as packaged units, come with each piece of equipment in one central location. Since the equipment is 'packaged' together, we are able to implement a temperature sensor and locked switchover point that cannot be tampered with or adjusted. The locked switchover temperature of 40°F is not accessible physically or digitally by installers, distributors, or homeowners. 5-2
    - Communicating, condensing and non-condensing furnaces:
        - In condensing and non-condensing applications, the equipment comes in two different pieces. Our communicating systems would ensure that the outdoor unit is always a heat pump and that the switchover temperature cannot be changed from 40°F. The heat pump and thermostat's "communication" with one another begins upon startup, and if the thermostat detects that it is installed with anything other than a heat pump, it will not work. Furthermore, if the thermostat detects that it is installed with a designated 40 ng/J furnace (which will have a special model number) and a heat pump, it will lock the temperature switchover point at 40°F and cannot be modified by any user or repair person. This communication method is hard-wired and does not rely on any outside internet or data connections.

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- With respect to the mitigation fees listed in Table 2 – Alternate Compliance Plan with the Phase One and Phase Two Mitigation Fee Schedules, we request that the mitigation fees be waived for dual fuel systems sold into the District beginning September 30, 2020. Since these systems have lower annual NOx emissions than a standard 40 ng/J furnace and air conditioner system we believe the mitigation fee, which serves to encourage compliance and subsequently reduce NOx emissions, should not apply. 5-3

We hereby propose the following changes to the preview version of PAR 1111:

Add definition of Communicating System as follows:

COMMUNICATING SYSTEM means:

A communicating system is enabled with microprocessors that allow for two-way communication between the indoor unit, outdoor unit and thermostat. This communicating capability allows for functionality such as: unit recognition upon install, optimizing system performance, performance data, and monitoring/alerts.

Modify Paragraph 6 as follows: 5-4

(6) ~~Effective October 1, 2021 and until September 30, 2022, a~~A manufacturer, distributor, or installer that manufactures, supplies, sells, offers for sale, or installs a natural gas furnace~~s~~ certified to meet 40 ng/J of NOx that is installed and operated as part of a dual fuel system ~~at or above 4,200 feet above sea level~~ in the South Coast AQMD, shall only install such a unit that:

(A) Is designed by the manufacturer with an external ambient switchover temperature of ~~3~~240°F with a nonadjustable system that would prevent any person from changing the external ambient switchover temperature of ~~3~~240°F;

(B) Includes installation of an external temperature sensor which acts as the sole method to determine ambient temperature; ~~switchover point;~~

(C) For Communicating Systems, ~~i~~includes communicating technology between system components at the point of manufacture to prevent system operation without a heat pump and prioritizes operation of the heat pump over the furnace; and

(D) The shipping carton or the name plate of the furnace clearly displays: "This furnace must be installed only in a dual fuel configuration with an electric heat pump. Installation of this furnace without a heat pump

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in a dual fuel configuration will be a violation of South Coast AQMD Rule 1111."

5-4 (cont'd)

Mitigation fees set forth in Table 2 shall not apply to 40 ng/J NOx furnaces that are installed and operated as part of a dual fuel system.

5-5

As Trane Technologies has repeatedly indicated given that the studies we have presented, including the study conducted by the University of California, Davis, have demonstrated that dual fuel systems including a low NOx furnace reduce annual NOx emissions by 96%. This technology includes many additional benefits, such as:

- Annual CO_2 emission reductions of more than 67%[1]
- Proven, robust technology with reliable operation
- Readily available to all manufacturers
- Installer familiarity with the technology and equipment
- Expanded size and capacity selections to allow for proper equipment sizing
- An economical path toward electrification for existing homes
  - Traditional all-electric systems can come with substantial conversion costs in order to accommodate for the new system's physical size and required voltage. Dual fuel eliminates this need by allowing consumers to utilize their existing installation space and voltage connections.
- Functionality at all altitudes, including high altitudes
- Expanded consumer choice which would include high efficiency, communicating air conditioning systems
  - These systems are incredibly limited today with current ultra-low NOx offerings

5-6

We understand and appreciate the concerns discussed with District Staff regarding dual fuel systems and their enforcement. However, we maintain our position that altering switchover temperatures would be highly improbable and impractical. Testimony from installers in our recent workshops has confirmed that there is simply no incentive for installers and homeowners to adjust switchover temperatures, or to purchase an entire dual fuel system to only install the low NOx furnace. If the District is willing to allow dual fuel for high altitude application, it would need to deal with the same enforcement issues and track the same recordkeeping requirements. As such, in light of all the benefits of

[1] Based on findings in a study conducted by the University of California, Davis Western Cooling Efficiency Center. Dichter, Nelson. "Analysis of NOx Emissions from Hybrid Heating Technologies in California." Western Cooling Efficiency Center. Accessed July 29, 2020. https://wcec.ucdavis.edu/wp-content/uploads/Analysis-of-NOx-Emissions.WCEC-Technical-Report.2020-01.pdf.

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dual fuel systems and the added benefit of further reducing California's GHG emissions, we respectfully request that you consider allowing dual fuel systems for all applications, not just at high altitude.

5-6
(cont'd)

We truly appreciate the District's ongoing dialog and coordination with Trane Technologies with respect to PAR 1111. We are confident that together we can work toward providing the best heating, ventilating, and air conditioning (HVAC) solutions that substantially reduce NOx and CO_2 emissions. Should you have any questions, please don't hesitate to contact us.

Best Regards,

Kellie Lindenmoyer

Kellie Lindenmoyer
Furnace Product Manager

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Response to Comment Letter #5

Response 5-1: This comment letter expands upon the previously received comment letter #4. Please see Responses 4-2 and 4-3 regarding dual fuel switchover temperatures and weatherized dual fuel systems, respectively.

Response 5-2: Staff acknowledges a dual fuel system with a 40 ng/J furnace has the potential, if designed properly, to generate lower NOx emissions than a standalone 14 ng/J furnace; however, allowing dual fuel systems with non-compliant 40 ng/J furnaces could create enforcement challenges. Such challenges include the ability for installers or consumers to change the "switchover temperature" setting through the system control panel. This could lead to noncompliant 40 ng/J NOx furnaces becoming more accessible for sale and installation in standalone applications within the District, adding uncertainty to the actual emission reductions. Comparatively, a dual fuel system with a 14 ng/J furnace provides even more emissions reduction, encourages new technology, and avoids additional enforcement concerns.

On this basis, staff does not recommend installation of dual fuel systems with noncompliant 40 ng/J NOx furnaces at elevations below 4,200 feet above sea level. On the other hand, staff is recommending an incentive through the Clean Air Rebate Program for dual fuel systems with compliant 14 ng/J NOx furnaces. Additional information on the considerations, comparative operating cost estimates, and enforcement concerns for dual fuel systems with 40 ng/J furnaces can be found in Chapter 2 of this report

Response 5-3: The current rule proposal is to allow dual fuel systems equipped with noncompliant 40 ng/J furnace in high altitude areas to not be subject to the mitigation fees listed in Table 2 – Alternate Compliance Plan with the Phase One and Phase Two Mitigation Fee Schedules.

Response 5-4: The current rule proposal further elaborates on the definition of communicating technology in subsection (g)(6)(C). For further discussion on how the switchover temperature of 32°F was determined, please see Response 4-2 to Comment Letter #4.

Response 5-5: Please see Response 5-3 with regard to mitigation fees.

Response 5-6: Staff appreciates the commenter's ongoing participation and collaboration during the development of the amendments to Rule 1111. Considerations were made with information provided by commenter's referenced study conducted by the UC Davis Western Cooling Efficiency Center (WCEC). Additional information on the determination of switchover temperature can be found in Response 4-2 to Comment Letter #4.

Additional information on the considerations, comparative operating cost estimates, and enforcement concerns for dual fuel systems with 40 ng/J furnaces can be found in Chapter 2 of this report.