

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

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

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Deputy Executive Officer

Planning, Rule Development, and Implementation
Sarah Rees, Ph.D.

Assistant Deputy Executive Officer

Planning, Rule Development, and Implementation
Michael Krause

Planning and Rules Manager

Planning, Rule Development, and Implementation
Heather Farr

Author: Peter Campbell – Air Quality Specialist

Contributors: Emily Yen – Assistant Air Quality Specialist
Sina Taghvaei, Ph.D. – Air Quality Specialist, CEQA
Farzaneh Khalaj, Ph.D. – Air Quality Specialist, CEQA

Reviewed by: Yanrong Zhu – Program Supervisor
Kevin Ni – Acting Program Supervisor, CEQA
Barbara Radlein – Acting Planning and Rules Manager, CEQA
Mary Reichert – Senior Deputy District Counsel

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WAYNE NASTRI

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EXECUTIVE SUMMARY

Rule 1111 – Reduction of NO_x Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces (Rule 1111) reduces emissions of nitrogen oxides (NO_x) from residential and commercial gas-fired fan-type space heating furnaces with a rated heat input capacity of less than 175,000 British thermal units (Btu) per hour or, for combination heating and cooling units, with a cooling rate of less than 65,000 Btu per hour.

Rule 1111 was adopted by the South Coast Air Quality Management District (South Coast AQMD) Governing Board in December 1978. The rule was amended in 2009 to lower the NO_x emissions limit from 40 to 14 nanograms per Joule (ng/J). The rule was later amended in 2014 to provide an alternate compliance option that allows the manufacturer to pay a per-unit mitigation fee, in lieu of meeting the lower NO_x emission limit, for up to 36 months past the applicable compliance date. Since then, the rule was amended several times to postpone the compliance dates to meet the 14 ng/J NO_x limit and extend the eligibility date for the mitigation fee alternate compliance option.

Mobile home (also known as manufactured home) furnaces, which constitute about four percent of the Rule 1111 furnace sales within the South Coast AQMD, will be required to comply with the 14 ng/J NO_x emission limit after September 30, 2023, when their mitigation fee alternate compliance option ends. Currently none of the manufacturers have made any progress on the development of compliant mobile home furnaces. Manufacturers stated that no development of models compliant with the 14 ng/J NO_x emission limit were planned due to the low volume of mobile home furnaces sold in the South Coast AQMD, challenges of meeting additional regulations, and future policy direction to analyze the feasibility of zero-emission NO_x limits. Manufacturers, distributors, and installers have stated that they will not be able to meet the September 30, 2023, compliance date for mobile home furnaces. All other furnace types meet the 14 ng/J limit.

Staff is proposing to extend the mitigation fee alternate compliance option for mobile home furnaces by two years. Manufacturers would continue to be allowed to comply by paying the mitigation fee for 40 ng/J NO_x units with recordkeeping and reporting requirements until September 30, 2025.

Following this proposed rule amendment, staff intends to commence another rule development to evaluate the feasibility of requiring zero-emission NO_x technologies for residential and commercial buildings, including for mobile home heating units, and propose appropriate compliance dates to meet potentially lower emission standards. The development of zero-emission standards will implement Control Measure R-CMB-02 for zero-emission residential space heating, which was included in the 2022 Air Quality Management Plan (AQMP) and adopted by South Coast AQMD Governing Board in December 2022. Control Measure R-CMB-02 sets the policy direction for Rule 1111 to align with California's zero-emission pathway for residential and commercial buildings.

CHAPTER 1: BACKGROUND

INTRODUCTION

REGULATORY HISTORY

EQUIPMENT AND PROCESS

REQUIREMENT AND TESTS FOR NEW TECHNOLOGY

AFFECTED INDUSTRIES

NEED FOR PROPOSED AMENDMENTS

PUBLIC PROCESS

INTRODUCTION

The purpose of Rule 1111 is to reduce NO_x 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, with a cooling rate of less than 65,000 Btu per hour. The rule applies to manufacturers, distributors, and installers of such furnaces and 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 includes an alternate compliance option that allows manufacturers to pay a per-unit mitigation fee for up to four to five 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 NO_x emission limit of 40 ng/J of heat output, which equivalent to a concentration of 61 parts per million (ppm) at a reference level of 3 percent oxygen and 80 percent Annual Fuel Utilization Efficiency (AFUE), beginning January 1, 1984.

New Lower NO_x Emission Limit of 14 ng/J Established

Rule 1111 was amended in November 2009 to implement the 2007 AQMP Control Measure CMB-03. The 2009 amendment established a new lower NO_x emission limit of 14 ng/J (equivalent to 22 ppm at a reference level of 3 percent oxygen and 80 percent 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 NO_x 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 (e.g., a sell-through period) for units manufactured and delivered into the South Coast AQMD prior to the compliance date.

Mitigation Fee to Delay Compliance of 14 ng/J Furnaces

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

Extension and Increase of the Mitigation Fee

Rule 1111 was again amended in March 2018 because of the lack of commercially available 14 ng/J furnaces in early 2018. The amendment increased the mitigation fee in two phases to a range of \$300 to \$450, depending on the furnace type and heat input capacity, and extended the

mitigation fee compliance option by one and a half 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-fired only furnaces.

Clean Air Furnace Rebate Program

In March 2018, the South Coast AQMD developed a rebate program for consumers who purchased and installed future compliant 14 ng/J furnaces in the South Coast AQMD. The purpose of the rebate program was to help commercialize future compliant furnaces and incentivize consumers to purchase and install them. 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. The South Coast AQMD Governing Board initially approved funding of \$3 million for the furnace rebate program, specifying a \$500 rebate for each compliant furnace. In September 2020, the Board approved additional funding of \$3.5 million, modifying the program to specify a \$500 rebate for up to 600 compliant weatherized furnaces, a \$500 rebate for up to 200 high-altitude compliant condensing or non-condensing furnace installations, and a \$1,500 rebate for each all-electric heat pump for central ducted space heating. Rebates for weatherized and high-altitude condensing and non-condensing furnaces ended on September 30, 2021, when remaining funds for those categories were reallocated for all-electric heat pump systems. Rebates for all-electric heat pump systems concluded in April of 2023 when funds were exhausted. The Clean Air Furnace Rebate Program incentivized the installation of over 2,400 heat pump installations, with 25 percent of funds allocated to low income and disadvantaged communities.

High-Altitude Furnaces Temporary Exemption and Extension

Rule 1111 was amended in December 2019 to include a temporary exemption from the 14 ng/J NO_x emission limit for condensing and non-condensing natural gas furnaces installed at elevations greater than or equal to 4,200 feet above sea level until September 30, 2020. During this interim exemption period, condensing and non-condensing furnaces installed in high-altitude areas were still required to meet the 40 ng/J NO_x emission limit. Rule 1111 was again amended in September 2020 to extend this exemption for one year, until September 30, 2021.

Further Extension of the Mitigation Fee Option for Weatherized Furnaces

The September 2020 Rule 1111 amendment also extended the mitigation fee compliance option by one year for weatherized furnaces, until September 30, 2021. As for high-altitude furnaces, the extension was to address the adverse impact of the COVID-19 pandemic on their development and commercialization.

Further Extension of High Altitude and Mobile Home Furnaces

The most recent Rule 1111 amendment in October 2021 further extended the mobile home furnace mitigation fee compliance option by two years, until September 30, 2023. High-altitude furnaces were allowed to be installed until March 31, 2022, with an exemption for downflow furnaces rated less than 175,000 Btu and condensing and non-condensing furnaces greater than 100,000 Btu replacing existing furnaces until September 30, 2022.

2022 AQMP Control Measure

In the 2022 AQMP, the Governing Board adopted control measure R-CMB-02: Emission Reductions from Replacement with Zero Emission or Low NO_x Appliances – Residential Space

Heating. This control measure proposed the development of zero-emission NO_x limits for residential space heating when feasible. The 2022 AQMP Policy Brief for Residential and Commercial Building Appliances¹ cited heat pumps as an energy-efficient zero-emission alternative to natural gas furnaces.

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, often referred to as a package unit, is packaged with an air conditioning condensing unit. A mobile home furnace (also known as manufactured homes) means a furnace designed specifically and solely for installation to heat a mobile home. Most mobile homes are designed to accommodate a smaller furnace, usually in a downflow configuration.² A downflow furnace draws the air from the top of the unit down through the combustion unit, usually to ducting below. The U.S. Department of Housing and Urban Development (HUD) regulates manufactured homes, which they defined as a factory-built home built after June 15, 1976. They define a factory-built home built prior to June 15, 1976, as a mobile home. New manufactured home gas furnaces must be approved by HUD and must include propane kits for compliant split systems to meet HUD requirement for propane compatibility³. These requirements generally mean non-mobile home furnaces cannot be used in a mobile home without retrofits.

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 NO_x 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 Air-Conditioning, Heating, and Refrigeration Institute (AHRI) certification

¹ http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/buildings_final.pdf

² <https://mobilehomeliving.org/mobile-home-furnaces/>

³ CFR Title 24 Part 3280, incorporating ANSI Z21.47-1990, <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>

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 (PAR 1111) affects manufacturers (NAICS 333), distributors and wholesalers (NAICS 423), and retailers and dealers (NAICS 444) of residential furnaces. PAR 1111 also affects construction and building contractors and installers (NAICS 238 and 811) because heating units regulated by the rule are used in most residential and many commercial settings for heating small buildings. AHRI, the major manufacturer's trade organization, indicates 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.

NEED FOR PROPOSED AMENDMENTS

As part of the implementation status monitoring, staff has been regularly reaching out to manufacturers for their progress on developing and commercializing compliant mobile home furnaces.

In the South Coast AQMD residential space heating market, about four percent are mobile home furnaces, are currently supplied by three manufacturers. Mobile home furnaces are specifically and solely for installation to heat mobile homes. A mobile home furnace may be a split system, in which the furnace and air conditioner are separated as indoor and outdoor units, respectively. It can also be a weatherized system, in which the furnace and air conditioner are packaged and installed as one outdoor system.

The mitigation fee period for mobile home furnaces ends on September 30, 2023, after which the 14 ng/J NO_x limit will be applicable. Currently none of the three mobile home manufacturers have made progress on the development of mobile home furnaces so no natural gas units are available to meet the upcoming 14 ng/J NO_x emission limit as required by the rule. In addition, the manufacturers are considering the business feasibility of investing in the lower NO_x emission technology for mobile home furnaces at this time; instead, they may consider putting resources toward electric heating such as heat pumps. While some zero-emission technologies are currently available, the market adoption for mobile homes is very limited. In addition, more time is needed to develop, test, and implement the zero-emission technology for broader mobile home applications. Feasibility of zero-emission technology may vary between new mobile homes whose design has not yet been formulated and existing homes whose footprint has already been established. Regardless, time is needed to develop, test, and implement; therefore, staff is proposing this rule amendment.

PUBLIC PROCESS

Staff has been holding ongoing individual meetings with manufacturers and environmental groups to monitor the rule implementation status. The discussions at these meetings included rule implementation status for compliant 14 ng/J mobile home furnaces, as well as future proposed zero emission standards. A Public Consultation is scheduled for July 19, 2023.

CHAPTER 2: SUMMARY OF PROPOSALS

INTRODUCTION

PROPOSED AMENDED RULE 1111

INTRODUCTION

Staff has been closely monitoring the progress of development and commercialization of future compliant mobile home furnaces; however, based on the implementation status, staff is proposing to extend the compliance date for mobile home furnaces by two years.

PROPOSED AMENDED RULE 1111**Rule 1111 Requirements**

Extending the mitigation fee alternate compliance option for mobile home furnaces until September 30, 2025

PAR 1111 proposes to extend the mitigation fee period for mobile home furnaces from September 30, 2023 to September 30, 2025, which is included in Table 2 in PAR 1111 and show below as Table 1. This proposal does not change the requirements for the mitigation fee or the recordkeeping and reporting requirements.

Table 1 – Alternate Compliance Plan with the Phase One and Phase Two Mitigation Fee Schedules

| Furnace | | Phase One Mitigation Fee | | Phase Two Mitigation Fee | | Phase Two Mitigation Fee Option End Date |
|-------------------------------------|------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|--|
| 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) | |
| ≤ 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 |
| | Mobile Home | October 1, 2018 | \$150 | April 1, 2019 | \$150 | September 30, 2023 <u>2025</u> |
| > 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 |
| | Mobile Home | October 1, 2018 | \$150 | April 1, 2019 | \$150 | September 30, 2023 <u>2025</u> |

| Furnace | | Phase One Mitigation Fee | | Phase Two Mitigation Fee | | Phase Two Mitigation Fee Option End Date |
|-----------------|------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|--|
| 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) | |
| > 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 |
| | Mobile Home | October 1, 2018 | \$150 | April 1, 2019 | \$150 | September 30, 2023 <u>2025</u> |

CHAPTER 3: IMPACT ASSESSMENT

INTRODUCTION

EMISSION IMPACTS

COST EFFECTIVENESS

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

SOCIOECONOMIC IMPACT ASSESSMENT

DRAFT FINDINGS UNDER HEALTH AND SAFETY CODE SECTION 40727

INCREMENTAL COST-EFFECTIVENESS

COMPARATIVE ANALYSIS

INTRODUCTION

Rule 1111 reduces emissions of NO_x from residential and commercial gas-fired fan-type space heating furnaces, and is applicable to manufacturers, distributors, and installers of those type of furnaces. The proposed rule amendment does not seek further emission reductions; the proposed amendment proposes to extend the mitigation fee period for mobile home furnaces which will delay some emission reductions.

EMISSION IMPACTS

Based on the 2022 AQMP emission inventory for fuel consumption, the annual average NO_x emissions from residential heating using natural gas were 11.67 tons per day (tpd) in 2018. 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 approximately one and a half to two pounds of NO_x per year. The emission rate reduction from 40 ng/J to 14 ng/J results in more than one pound per year of NO_x emission reductions for each furnace.

Total mobile home furnace annual sales are estimated at 6,000 units in the South Coast AQMD. A two-year delay in compliance would result in an estimated 0.016 tpd of delayed emission reduction [calculated as: $(2 \times 6,000 \times 1.0)/(2,000 \times 365)$]. The future rule development for zero-emissions could potentially reduce the overall amount of delayed emission reductions.

COST-EFFECTIVENESS

A cost effectiveness analysis is not required for PAR 1111 as the proposed amendment does not impose additional requirements on manufacturers, distributors, wholesalers, retailers, and dealers of residential furnaces.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Pursuant to the California Environmental Quality Act (CEQA) and South Coast AQMD's certified regulatory program (Public Resources Code Section 21080.5, CEQA Guidelines Section 15251(l) and South Coast AQMD Rule 110), the South Coast AQMD, as lead agency, is currently reviewing the proposed project (PAR 1111) to determine if it will result in any potential adverse environmental impacts. Appropriate CEQA documentation will be prepared based on the analysis.

SOCIOECONOMIC IMPACT ASSESSMENT

Proposed Amendments to PAR 111 are not expected to result in emission reductions and will not significantly affect air quality or emissions limitations. Therefore, a socioeconomic impact assessment is not required under Health and Safety Code Sections 40440.8 and 40728.5.

DRAFT FINDINGS UNDER HEALTH AND SAFETY CODE SECTION 40727

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 Health and Safety Code Section 40727, Health and Safety Code Section 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 extend the mitigation fee alternate compliance option for mobile home furnaces.

Authority: The South Coast AQMD obtains its authority to adopt, amend, or repeal rules and regulations from 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 statutes: 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, carbon monoxide, sulfur oxides, NO_x, 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 and Safety Code Section 40727.2(g) which requires a comparative analysis is applicable when a proposed amended rule or regulations imposes, or has the potential to impose, a new emissions limit or standard, or increased monitoring, recordkeeping, or reporting requirements. In this case for PAR 1111, a comparative analysis is not required because the amendments do not impose such requirements.