# SANTA BARBARA COUNTY
# AIR POLLUTION CONTROL DISTRICT

## Draft Staff Report for:

**Amended Rule 360 - Boilers, Water Heaters, and Process Heaters (0.075 – 2 MMBtu/hr)**

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Our Mission

*Our mission is to protect the people and the environment of Santa Barbara County from the effects of air pollution.*

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# 1. EXECUTIVE SUMMARY

Rule 360 is a point-of-sale rule that regulates oxides of nitrogen (NOx) and carbon monoxide (CO) emissions from boilers, water heaters, steam generators, and process heaters with a rated heat input capacity of 0.075 to 2.0 million British thermal units per hour (MMBtu/hr). The proposed amendments are geared towards reducing the applicable NOx limits of these units. Beginning on January 1, 2019, newly installed and modified units need to be certified to a NOx emission limit of 20 parts per million by volume (ppm). The amendments fulfill a commitment from the Santa Barbara County Air Pollution Control District's (District's) *2016 Ozone Plan*, and the amendments are based on similar requirements that have been implemented in neighboring air districts for the last 5 years.

# 2. BACKGROUND

## 2.1 Source Category Description

There are many of types of boilers, water heaters, steam generators, and process heaters subject to Rule 360. They range from smaller units that are used to provide domestic hot water for a school or hotel to larger units that produce high pressure steam for use in industrial processes. Other typical applications for this source category may include: space heating, food processing, garment laundering, or equipment sterilization. All of these devices function by combusting a fuel and transferring the heat of combustion to water or to a process stream.

The two main pollutants of concern for a combustion process are oxides of nitrogen (NOx) and carbon monoxide (CO). Because the proposed emission limits are already required in other California air districts, units that meet the limits are readily available. The design features that allow units to meet the proposed limits typically reduce thermal NOx formation by changing the flame characteristics to reduce the peak flame temperature. Some of the design principles used in low-NOx burners include staged air burners, staged fuel burners, and pre-mix burners, all of which provide a well-controlled, efficient combustion process with minimized emissions.

## 2.2 Rule 360 Background

The District's Governing Board initially adopted Rule 360 on October 17, 2002. As a point-of-sale rule, Rule 360 applies to any person who supplies, sells, offers for sale, installs, or solicits the installation of boilers, water heaters, steam generators, and process heaters with a rated heat input of 0.075 MMBtu/hr to 2.0 MMBtu/hr. Affected persons include manufacturers, plumbing wholesalers, supply stores, contractors, and end-users of said equipment. This point-of-sale approach allows the District to achieve NOx emission reductions without forcing the immediate replacement of existing units and thus placing an undue financial burden on the end-user.

The 2002 rule implemented a NOx emission limit of 30 ppm for units 0.4 - 2.0 MMBtu/hr and 55 ppm for units with a rated heat input of 0.075 - 0.4 MMBtu/hr. To verify that these emission limits are met, Rule 360 requires that the manufacturers certify their units through the District's certification program. The District has also previously accepted the similar South Coast Air

Quality Management District (SCAQMD) certification process as required by their Rule 1146.2. Both of these processes require that the manufacturer obtain a certification source test from an independent testing laboratory for each unit model in order to verify compliance with the applicable emission limits. The manufacturer is then required to submit the certification source test as part of a compliance report that identifies the manufacturer, brand name, model, and description of the unit being certified. SCAQMD has worked extensively with manufacturers subject to SCAQMD Rule 1146.2 to certify thousands of units and provides a list of certified units on their website for reference. Only a handful of manufacturers have ended up using the District's certification process since many of them have already had their units certified by the SCAQMD.

The District submitted the initially adopted Rule 360 to the California Air Resources Board (CARB) for forwarding to the EPA as an amendment to the State Implementation Plan (SIP).[1] EPA finalized their approval of Rule 360 on October 14, 2003. The proposed amendments to Rule 360 are anticipated to be sent to the EPA for SIP approval as well.

### 2.3 Mandates

Ground level ozone is a secondary pollutant formed from photochemical reactions of the precursor pollutants nitrogen oxides (NOx) and reactive organic compounds (ROCs), in the presence of sunlight. Ozone is a strong irritant that adversely affects human health and damages crops and other environmental resources. Both short-term and long-term exposure to ozone can irritate and damage the human respiratory system, resulting in:

- Decreased lung function,
- Development and aggravation of asthma,
- Increased risk of cardiovascular problems such as heart attacks and strokes,
- Increased hospitalizations and emergency room visits, and
- Premature deaths.

The District is in attainment for most of the National Ambient Air Quality Standards; for the federal 8-hour ozone standard that was adopted in 2015, the District's attainment status has not yet been designated by EPA, but it is expected to be attainment.

Pursuant to California Health and Safety Code (H&SC) Section 40925.5, the District is currently designated as nonattainment-transitional for the state ozone standard. As required by the California Clean Air Act, the District prepared the 2016 Ozone Plan that includes a schedule for implementing control measures to reduce emissions of ozone precursors. H&SC Section 40925.5 required the District to review the 2016 Ozone Plan's rule schedule after being designated nonattainment-transitional. The review and revision to the rule schedule were approved by the District Board on August 17, 2017.[2]

[1] Additional information on California's SIP can be found here: https://www.arb.ca.gov/planning/sip/sip.htm
[2] Additional information on the District's change in designation to nonattainment-transitional, and the changes to the 2016 Ozone Plan's control measure implementation schedule, can be found here: https://www.ourair.org/planning-clean-air/

The proposed amendments to Rule 360, which regulates emissions from boilers, water heaters, steam generators, and process heaters, are considered to be a "feasible measure." The rule amendments were identified in both the District's 2013 Clean Air Plan and 2016 Ozone Plan because many other Districts have adopted and implemented similar requirements in the last 5 years. The District's 2016 Ozone Plan and the revised nonattainment-transitional rule schedule include a commitment to achieve NOx emission reductions from this category.

Since the District was recently designated as nonattainment-transitional, H&SC Section 40930 requires the District to do a cost-benefit analysis and provide a justification before any new control measures are adopted. That analysis is included in Section 5 of this staff report.

# 3. PROPOSED RULE AMENDMENTS

## 3.1 Overview of Proposed Amendments

The District is proposing the following major amendments to Rule 360:

- Lowering the NOx emission limit for all natural gas-fired units from 55 or 30 ppm down to 20 ppm.
- The new emission limits would become effective on January 1, 2019, giving distributors time to sell any equipment meeting the old standards.
- Adding an exemption for recreational vehicles, manufactured homes, hot water pressure washers, and portable water heaters used for underwater diving activities.
- Clarifying the applicable testing requirements.

All of the amendments are described in further detail in their corresponding sections below.

## 3.2 Rule Title

When Rule 360 was initially adopted in 2002, it was named "Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers." This name, by itself, informs the reader that if you have a boiler or water heater, you should read the rule to learn if there are any applicable requirements to your equipment unit. However, the naming becomes more convoluted when comparing it to other District-adopted boiler and water heater rules, such as:

- Rule 352 – Natural Gas-Fired Fan-Type Central Furnaces and Small Water Heaters
- Rule 361 – Small Boilers, Steam Generators, and Process Heaters
- Rule 342 – Control of Oxides of Nitrogen (NOx) from Boilers, Steam Generators, and Process Heaters

To minimize the confusion between the various boiler rules, a new naming convention will be used for future amendments to all of the above-mentioned rules, including Rule 360.

Proposed Rule 360 will be named "Boilers, Water Heaters, and Process Heaters (0.075 – 2 MMBtu/hr)." This title creates a simplified boiler rule naming convention that conveys the

applicability without having to open the rule, which will help the public quickly identify the applicable rule for their equipment unit.

### 3.3 Exemptions

"Recreational Vehicles" and "Manufactured Homes"

An exemption for units installed in "recreational vehicles" and "manufactured homes" is proposed. These units are typically below the applicability range of 0.075 MMBtu/hr. Furthermore, these units do not operate very frequently and other California air districts, such as the SCAQMD and the Bay Area Air Quality Management District, exempt these units as well. Because the emission contribution is small and also in the interest of consistency with other air districts, District staff is proposing to include this exemption.

"Pressure Washers"

From reviewing neighboring air district rules, it became apparent that "pressure washers" could be considered "water heaters." Pressure washers are used in various industries, including food processing, construction, and transportation industries. The pressure washers are used to clean and degrease machinery, vehicles, work surfaces, and floors. As such, most units are portable and are fired on diesel fuel since it is more readily available and practical for portable uses than natural gas. Since most hot water pressure washers are portable, add-on NOx controls are not feasible. In addition, these units are generally used for short duration projects. Due to the limited use of these types of units, it is not cost-effective to require low-NOx burners. Furthermore, the initially adopted Rule 360 was not intended to regulate pressure washers, so they are proposed to be exempted from the rule.

"Water Heaters used for Underwater Diving"

Water heaters are sometimes used to supply heated water to underwater divers as a form of temperature control. The portable heaters are stationed on the surface and they send the water to the diver via insulated pipes in the umbilical line. Due to the portability of these units, they are typically diesel-fired. When the District became aware of these types of units in 2008, an exemption from permit requirements was added to District Rule 202. Since the initially adopted Rule 360 never intended to regulate these portable water heaters, they are proposed to be exempted from Rule 360 as well.

### 3.4 Definitions

"Modify"

Since the initial adoption of Rule 360, the District has encountered some instances where an operator replaces the burner on an older, higher-emitting unit to extend the useful life of the unit instead of purchasing a new, lower-emitting certified unit. To prevent this from occurring, the District proposes to add the definition for "modify" to Rule 360. Under this definition, any operator who replaces the burner or reinstalls the equipment at a location other than the site of its original location shall comply with the applicable emission limits required by the rule at the time

of the modification. This language keeps Rule 360 consistent with the previously adopted Rule 361 and its associated determinations.

"Rated Heat Input Capacity"

This definition change is made to keep Rule 360 consistent with the previously adopted Rule 361 and its associated determinations. It provides additional clarity in regards to any unit that may have been derated to make sure that it follows the proper procedures.

### 3.5 Requirements - Emission Limits

"New Limits - 20 ppm"

The focus of this rule amendment is to lower the existing emission limits to a more stringent 20 ppm NOx emission limit. This limit was originally identified by the SCAQMD as a feasible standard in their 2006 rule, which required new units to meet the 20 ppm limit by 2010 or 2012, depending on their size. Since 2006, other air districts across the state have amended their rules to reflect the lower SCAQMD standard, and accordingly, it was identified in the District's Ozone Plan as a rule amendment that should be pursued.

It is understood that not all fuel types can easily meet the 20 ppm NOx standard. Units that are fired on non-pipeline quality natural gas, such as boilers that are fired on digester gas at a wastewater treatment plant, can't easily achieve these emission levels. This is mainly due to the fluctuations or impurities in the fuel. These other fuel types have different emission standards in the rule to reflect what is feasible with the available technologies. Hence, no changes are proposed for the emissions limits that apply to non-natural gas units.

The rule would remain as a point-of-sale or attrition rule instead of a forced replacement rule. The new limits are proposed to become effective on January 1, 2019, which gives distributors time to sell or relocate any equipment that does not meet the new emission standards. Prior to January 1, 2019, the previously adopted emission limits, as referenced in Table 1 of the rule, would still apply.

"Pool Heaters"

Pool/spa heaters rated at less than 400,000 Btu/hr are typically used for small residential pools and spas. Equipment in this size range for pools and spas is not well developed to meet the 20 ppm emission limit. This is mainly because the cost-effectiveness estimate is quite high for these pool heaters due to the limited number of hours that they operate each year. Furthermore, no other air district has proposed a lower $NO_x$ emission limit for small pool heaters. Therefore, no changes to the emission limits for this category are proposed.

### 3.6 Compliance Certification

New text has been added that allows the SCAQMD certification to be used in lieu of the District's own certification process. The District currently accepts SCAQMD certification for these units, since many manufacturers have already obtained a SCAQMD certification and the SCAQMD program was determined to be equivalent to our own. Accordingly, text was added to clarify this option for manufacturers.

### 3.7 Testing Provisions

Rule 360 also applies to non-natural gas-fired units. However, the test methods in the rule were only focused on the SCAQMD protocol for natural gas-fired units, and those methods cannot be used for other fuel types. Hence, the test methods had to be expanded. New text has been added that clarifies the standard source test methods and compliance demonstration requirements for all applicable fuel types.

# 4. COMPARISON WITH OTHER AIR DISTRICTS

The District compared Rule 360 to the following analogous rules in other air districts:

- South Coast Air Quality Management District
  Rule 1146.2 - Emissions of Oxides of Nitrogen From Large Water Heaters and Small Boilers and Process Heaters
- Ventura County Air Pollution Control District
  Rule 74.11.1 - Large Water Heaters and Small Boilers
- San Joaquin Valley Air Pollution Control District
  Rule 4308 - Boilers, Steam Generators, and Process Heaters – 0.075 MMBtu/hr to less than 2.0 MMBtu/hr
- Bay Area Air Quality Management District
  Regulation 9, Rule 6 - Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters
- Sacramento Metropolitan Air Quality Management District
  Rule 414 - Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour
- Yolo-Solano Air Quality Management District
  Rule 2.37 - Natural Gas-Fired Water Heaters and Small Boilers
- Placer County Air Pollution Control District
  Rule 247 - Natural Gas-Fired Water Heaters, Small Boilers and Process Heaters
- Feather River Air Quality Management District
  Rule 3.23 - Natural Gas-Fired Water Heaters, Small Boilers, and Process Heaters

A comparison of the District's proposed rule to some of the neighboring air district rules is shown below in Table 4.1. Based on the District's analysis, the proposed amended Rule 360 does not require any provisions that are more stringent than what has already been adopted in these other air districts. Furthermore, the rule was written so that is as consistent as possible with the neighboring air districts while still adequately acknowledging the specific needs of the region covered by the Santa Barbara County Air Pollution Control District.

**Table 4-1: Comparison of Nearby Air District Rules on Boilers, Water Heaters, and Process Heaters**

| RULE DESCRIPTION / DISTRICT | | SANTA BARBARA APCD Rule 360 (Proposed) | SOUTH COAST AQMD Rule 1146.2 (2006) | VENTURA APCD Rule 74-11-1 (2012) | SAN JOAQUIN VALLEY APCD Rule 4308 (2013) |
|---|---|---|---|---|---|
| **Section** | **Rule Component** | | | | |
| **Applicability** | MMBtu/hr rating | 0.075 – 2.0 | 0.075 – 2.0 | 0.075 – 1.0 | 0.075 – 2.0 |
| | Fuel Type | All Gas/Liquid/Solid Fuels | Natural Gas | Natural Gas | All Gaseous/Liquid Fuels |
| | Type of Rule | Point of Sale | Point of Sale + 15 year Phase-out | Point of Sale | Point of Sale |
| | When are the new limits effective? | 2019 | 2010 - 2012 | 2013 - 2014 | 2015 |
| **Exemptions** | Recreational Vehicles | Yes | Yes | No | Yes |
| | Manufactured Homes | Yes | No | No | Yes |
| | Pressure Washers | Yes | No | No | Yes |
| **Emission Limits** | Pool Heaters 0.075 – 0.40 MMBtu/hr | 55 ppm NOx | 55 ppm NOx | 55 ppm NOx | 55 ppm NOx |
| | All other units 0.075 – 0.40 MMBtu/hr | 20 ppm NOx | 20 ppm NOx | 20 ppm NOx | 20 ppm NOx |
| | 0.40 – 2 MMBtu/hr | 20 ppm NOx 400 ppm CO | 20 ppm NOx 400 ppm CO | 20 ppm NOx 400 ppm CO | 20 ppm NOx 400 ppm CO |
| | Emission Limit units | ppm or ng/J heat output | ppm or ng/J heat output | ppm or ng/J heat output | ppm or lb/MMBtu heat input |
| **Certification** | Certifying Agencies | SCAQMD/itself | SCAQMD | SCAQMD/itself | SCAQMD/itself |
| | Label Required | Yes | Yes | Yes | Yes |
| **Test Methods** | Test Methods | SCAQMD method or CARB/EPA methods | SCAQMD method | SCAQMD method or CARB method | SCAQMD method or CARB/EPA methods |

# 5. IMPACTS OF THE PROPOSED RULE

## 5.1 Emission Impacts

When aggregated, the emissions from all the units subject to Rule 360 represent a substantial portion of the District's emission inventory. However, since most of these units are exempt from the requirements to obtain a District Permit to Operate, we do not have a definitive count of the total number of units in the county. To obtain an approximate inventory of the Rule 360 units, the District is relying on the studies performed by the South Coast Air Quality Management District (SCAQMD) when they adopted their Rule 1146.2. Prior to their rule proceeding, the SCAQMD gathered data from equipment manufacturers and conducted a statistical survey. Since District Rule 360 regulates the same class and size of units as those subject to SCAQMD Rule 1146.2, the District is using the same assumptions to determine the Santa Barbara County inventory.

Using the SCAQMD assumptions, District staff applied the population-to-unit ratios in order to derive the number of units needed to support the human population in the District. For every 350 people, there is one unit in the size range of 0.075 MMBtu/hr to 0.4 MMBtu/hr and for every 750 people, there is one unit in the size range of greater than 0.4 MMBtu/hr to 2.0 MMBtu/hr. Multiplying the county's estimated population of 450,000 people by the population-to-unit ratios, District staff estimated the unit inventory, as shown in the Table 5-1 below.

**Table 5-1: Estimated Number of Units in the District based on Population**

| MMBTU Range | District Population | Population to Unit Ratio | Number of Units |
|---|---|---|---|
| 0.075 – 0.4 MMBtu/hr | 450,000 | 350: 1 | 1,285 |
| 0.4 – 2.0 MMBtu/hr | 450,000 | 750: 1 | 600 |
| | | **Total Units:** | **1,885** |

Since this is a point-of-sale rule, the NOx emission reductions from this proposed rule amendment will occur gradually as units are replaced with newer certified units and as new units are purchased for new developments. Heating equipment that meets the 20 ppm NOx emission limit is currently available from local equipment suppliers and some of these units have already been installed in the county. For these types of units, the average life expectancy is anticipated to be 20 years. For this analysis, it is assumed that over the course of the next 20 years, all existing heating equipment subject to this rule will be replaced in a linear fashion, with about 5% replaced per year.

The following additional assumptions were used to calculate the emission inventory and reductions for units subject to Rule 360:

- A capacity factor of 0.22 was used to develop baseline emissions.[3]

[3] Assumption is based on the 2006 SCAQMD staff report for Rule 1146.2 and confirmed by data reported to them in a 2004 Southern California Gas boiler study.

    - The capacity factor represents the fraction of fuel actually burned by the unit in a year compared to the maximum amount of fuel that a unit could use in a year.
- The distribution of heat input ratings was assumed to be uniform throughout the interval covered by the rule.
    - For the smaller units, the average heat input rating was calculated as:
        - (0.075 + 0.4) / 2 = 0.24 MMBtu/hr
    - For the larger units, the average heat input rating was calculated as:
        - (0.4 + 2.0) / 2 = 1.2 MMBtu/hr
- All existing units were assumed to meet the requirements of the current version of Rule 360.
    - This correlates to a NOx emission factor of 30 ppm (0.036 lbs/MMBtu heat input) for larger units and 55 ppm (0.067 lbs/MMBtu heat input) for smaller units.
- All newly installed units were assumed to meet the proposed limit of 20 ppm (0.024 lbs/MMBtu).
- The total number of units in the county was assumed to remain constant over the next 20 years.

Using the assumptions listed above, the total emissions in tons per year (tpy) for the units can be calculated as follows:

tpy = No. of Units * Avg. Rating * Emission Factor * Capacity Factor * (hrs/year) / (lbs/ton)

Both the current emission inventory and the anticipated emission reductions are shown in the two tables below.

**Table 5-2: Estimated Emissions from Rule 360 Units**

| **# Units** | **Average Rating** (MMBtu/hr) | **Emission Factor** (lb/MMBtu) | **Capacity Factor** | **hours/ year** | **lbs/ton** | **NOx emissions** (tpy) |
|---|---|---|---|---|---|---|
| 1,285 | 0.24 | 0.067 | 0.22 | 8,760 | 2,000 | 19.9 |
| 600 | 1.2 | 0.036 | 0.22 | 8,760 | 2,000 | 25.0 |
| | | | | | **Total TPY:** | **44.9** |

**Table 5-3: Estimated Emission Reductions from Rule 360 Units**

| **# Units** | **Average Rating** (MMBtu/hr) | **Change in EF** (lb/MMBtu) | **Capacity Factor** | **hours/ year** | **lbs/ton** | **NOx emission reductions** (tpy) |
|---|---|---|---|---|---|---|
| 1,285 | 0.24 | (0.067 – 0.024) | 0.22 | 8,760 | 2,000 | 12.8 |
| 600 | 1.2 | (0.036 – 0.024) | 0.22 | 8,760 | 2,000 | 8.3 |
| | | | | | **Total TPY:** | **21.1** |

The anticipated emission reductions from this rule amendment were calculated to be 21.1 tons of NOx per year after the rule is fully implemented and all of the older units are replaced.

## 5.2 Cost-Effectiveness

Health and Safety Code Section 40703 requires the District, in the process of the adopting or amending a rule, to consider and make public its findings related to the cost-effectiveness of a control measure. Cost-effectiveness, for rule-making purposes, is calculated by taking the estimated compliance costs of the rule and dividing it by the amount of air pollution reduced.

Estimated compliance costs for a rule can include, but are not limited to, capital equipment costs, engineering design costs, installation costs, and on-going maintenance costs, such as additional labor or fuel. Because the rule is not forcing additional or early replacement of units, the only cost that is expected to vary for units that comply with a 20 ppm NOx emission limit is the capital cost of the equipment. Although newer units typically have a higher thermal efficiency, the District is assuming that there will be no cost savings from using less fuel. Therefore, the cost to comply with this proposed rule amendment consists solely of the price differential between non-compliant and compliant units.

District staff examined what other districts assumed for price differences between units at the proposed 20 ppm standard and units at the current standard to come up with the estimated differential capital costs for 3 different sized units. These 3 units represent the full range of unit sizes that are covered by the rule, and the differential capital costs are shown in the table below:

**Table 5-4: Differential Capital Cost per Unit**

| **Unit Size** (MMBtu/hr) | **Bay Area AQMD** | **South Coast AQMD** | **San Joaquin Valley APCD** |
|---|---|---|---|
| **0.075** | $100 | $200 | $100 |
| **0.4** | $250 | $630 | $750 |
| **2.0** | $500 | $2,800 | $3,000 |

After evaluating the numbers used by the other air districts, the values used by the San Joaquin Valley APCD were determined to be the most up-to-date and representative of similar scenarios that would occur in Santa Barbara County. Hence, the San Joaquin Valley numbers were used for this assessment.

Based on a Rule 1146.2 implementation study conducted by the SCAQMD, the average useful life of boilers is approximately 20 years. Some units may need to be replaced sooner, and others could last up to 30 years if they're maintained properly. For the purpose of this assessment, the District assumed that a unit is replaced after 20 years. The costs listed above are assumed to be the additional initial costs that are necessary at the start of the 20 year period.

For cost-effectiveness calculations, the District uses the Levelized Cash Flow (LCF) method. In the LCF method, a capital recovery factor (CRF) is used to transform the capital cost into an equivalent annual cost. The CRF is necessary because the one-time capital expenditure reduces emissions over the entire duration of the project life. Hence, the CRF is a function of the real interest rate and equipment life. The annualized capital equipment cost is calculated using the following formula:

Annualized Cost = Differential Capital Cost * Capital Recovery Factor (CRF)

$$CRF = \frac{i * (1 + i)^n}{(1 + i)^n - 1} = \frac{0.06 * (1 + 0.06)^{20}}{(1 + 0.06)^{20} - 1} = 0.087$$

Where:

i = Real Interest Rate (6%)
n = Equipment Life (20 years)

Using the above equation, the annualized costs for each unit are as follows:

**Table 5-5: Estimated Annualized Costs per Unit**

| **Unit Size** (MMBtu/hr) | **Differential Capital Cost** | **CRF** | **Annualized Cost** ($/yr) |
|---|---|---|---|
| 0.075 | $100 | 0.087 | $9 |
| 0.4 | $750 | 0.087 | $65 |
| 2.0 | $3,000 | 0.087 | $260 |

The total estimated emission reductions calculated for all of the units in this size category was previously shown as 21.1 tons per year of NOx. However, cost-effectiveness calculations depend on the emission reductions from a single unit. The emission reductions per unit are estimated using the same assumptions and methodology as used in Section 5.1, Emission Impacts.

**Table 5-6: Estimated Emission Reductions per Unit**

| **Unit Size** (MMBtu/hr) | **Change in EF** (lb/MMBtu) | **Capacity Factor** | **hrs/year** | **lbs/ton** | **NOx emission reductions** (tpy) |
|---|---|---|---|---|---|
| 0.075 | (0.067 – 0.024) | 0.22 | 8,760 | 2,000 | 0.0031 |
| 0.4 | (0.067 – 0.024) | 0.22 | 8,760 | 2,000 | 0.0166 |
| 2.0 | (0.036 – 0.024) | 0.22 | 8,760 | 2,000 | 0.0231 |

For calculating the final cost-effectiveness in dollars per ton, the annualized cost of a unit is divided by one year's worth of the estimated emission reductions for the unit. The final cost-effectiveness values for each unit type are as follows:

**Table 5-7: Cost-Effectiveness per Unit**

| **Unit Size** (MMBtu/hr) | **Annualized Cost** ($/yr) | **NOx Reductions** (tpy) | **Cost-Effectiveness** ($/ton) |
|---|---|---|---|
| 0.075 | $9 | 0.0031 | $2,800 |
| 0.4 | $65 | 0.0166 | $3,900 |
| 2.0 | $260 | 0.0231 | $11,300 |

These cost-effectiveness values are within the acceptable range of previously adopted boiler prohibitory rules, and so Rule 360 is considered to be cost-effective.

### 5.3 Incremental Cost-Effectiveness

H&SC Section 40920.6 requires the assessment of incremental cost-effectiveness for a regulation that identifies more than one control option to meet the same emission reduction objectives. The incremental cost-effectiveness is the difference in cost between two successively more effective control strategies, divided by the additional emission reductions achieved for each of the control strategies.

When comparing alternative technologies available for achieving NOx reductions for small boilers, the most cost-effective means is implementing low-NOx burners. Two additional technologies that have been explored for larger-sized boilers are flue gas recirculation (FGR) and selective catalytic reduction (SCR). Flue gas recirculation and selective catalytic reduction are alternatives to low-NOx burners that can provide greater emission reductions, potentially down to 12 ppm. However, the costs involved with these alternatives are 3-5 times higher than the costs with low-NOx burners. Manufacturers have stated that it would be infeasible to require such stringent emissions controls on such small units for the minimal emission decrease.[4]

Additionally, SCR is designed for industrial units that operate under steady, stable conditions and can maintain the temperature that the catalyst requires for NOx reduction. Smaller units that are turned on and off throughout the day cannot maintain the temperatures required to effectively control NOx emissions. Finally, both FGR and SCR systems require frequent maintenance, which is not practical for small service/commercial settings.

For all of these reasons, the proposed NOx emission limit of 20 ppm is considered the lowest certifiable NOx emission limit in practice for this size range of units. However, please note that permitted units that are subject to the Best Available Control Technology (BACT) requirements from District Rule 802, New Source Review, may still be subject to more stringent emissions limits than the proposed limit of 20 ppm in Rule 360. This is because BACT is the most effective emission control technique which has been achieved in practice, and a lower limit, such as 12 ppm, is still achievable despite the additional costs.

### 5.4 Socioeconomic Impacts

H&SC Section 40728.5 requires the Board to consider the socioeconomic impact of any new rule if air quality or emission limits are significantly affected. However, Districts with a population of less than 500,000 persons are not required to do this socioeconomic analysis. Using 2010 census data and the expected growth rates for the County from the Santa Barbara County Association of Governments, the current population of 450,000 is below the 500,000 person threshold. Therefore, the District is not required to consider the socioeconomic impacts of the proposed rule amendment.

[4] Sacramento Metropolitan Air Quality Management District – Staff Report for Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu per Hour), January 15, 2010

### 5.5 Impact to Industry

Rule 360 is a point-of-sale rule and the source categories affected include boiler and water heater manufacturers, distributors, plumbing wholesalers, and contractors. Since the units affected by the proposed amendments are found throughout the commercial sector, a wide range of businesses and industries may be affected.

The amendment of Rule 360 will have a small fiscal impact on purchasers of new boilers, water heaters, and process heaters. The rule does not require businesses to replace their equipment, but when they choose to replace the equipment, they must purchase the low-NOx units. New equipment meeting the emission limits of proposed Rule 360 costs approximately 5-10% more than equipment with higher emissions. These additional costs were documented in Section 5.2, above.

In some instances, purchasing a new unit may result in cost savings. While the low-NOx equipment costs more, businesses can save on fuel costs by using the newer, more efficient units. Please note that in the cost-effectiveness calculations of this staff report, a conservative approach was used and so it was assumed that there would be no fuel savings.

Because many manufacturers already offer compliant equipment and the incremental cost increase is small in proportion to the total price of a replacement unit, staff concludes that meeting the proposed 20 ppm limit will not significantly impact industry.

### 5.6 Impact to the District

Since 2008, a District permit has been required for equipment with an input rating of 2 million Btu/hr and greater, or for multiple smaller units feeding the same load where the combined thermal rating adds up to 2 million Btu/hr or greater. Most Rule 360 applicable units are used on their own and so they are exempt from the requirements to obtain a Permit to Operate. There are approximately 1,885 units in the District in the Rule 360 size range. Approximately 220 units are permitted and the estimated 1,665 remaining units are located at facilities that are exempt from permit requirements.

The proposed amendments are not expected to result in any significant increased workload for District staff since the proposed rule will remain at the point-of-sale level and will be implemented by manufacturers, contractors, and retailers. Occasional compliance checks at non-permitted businesses or construction sites may be performed by District staff to verify compliance with the provisions of this rule. Since this is already a part of the District's ongoing compliance program, increases in staff workload are not anticipated due to the amendments. As for the permitted equipment, businesses that operate under a District permit and choose to modify or replace their equipment are assessed an application fee to cover District costs. These businesses would be subject to District permit requirements regardless of this rule amendment.

### 5.7 Cost-Benefit Analysis

As discussed in the entirety of Section 5, there are both additional costs to industry and emission reduction benefits from the proposed amendments. The additional costs to industry are within the

acceptable range of the previously adopted boiler prohibitory rules, and although we are not able to determine the precise amount of emission reductions needed to achieve attainment for the state 8-hour ozone standard, additional reductions of NOx emissions will help to ensure that the District eventually achieves attainment with the health-based standard and will add a margin of safety towards achieving that goal. Hence, the proposed amendments will satisfy the mandates from the California H&SC.

# 6. ENVIRONMENTAL IMPACTS – CEQA

## 6.1 Environmental Impacts

California Public Resources Code Section 21159 requires the District to perform an analysis of the reasonably foreseeable environmental impacts of the methods of compliance. The analysis shall take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites.

The analysis must include the following information on the proposed rule:

(1) *An analysis of the reasonably foreseeable environmental impacts of the methods of compliance.*

Rule 360 is a point-of-sale rule, where new, low-NOx units replace obsolete standard units over time. Since units become obsolete at different rates and low-NOx units are expected to become obsolete at the same rate as standard units, no additional waste is expected to appear in landfills. In addition, old water heaters and small boilers are frequently recycled. The new low-NOx units are expected to cause no adverse environmental impacts.

(2) *An analysis of the reasonably foreseeable mitigation measures.*

Since no adverse environmental impacts are expected, no mitigation measures are proposed.

(3) *An analysis of the reasonably foreseeable alternative means of compliance with the rule or regulation.*

No alternatives are proposed. As previously discussed in the staff report, there are a number of manufacturers supplying equipment that complies with the proposed rule. Manufacturers are expected to continue to develop compliant equipment, increasing competition and decreasing costs. The above analysis under Public Resource Code Section 21159 further demonstrates that there is no reasonable possibility that the amendment of proposed Rule 360 will have a significant effect on the environment due to unusual circumstances.

## 6.2 CEQA Requirements

The District prepared a program Environmental Impact Report (EIR) for the 2010 Clean Air Plan that evaluated the potential environmental impacts related to the implementation of several

control measures aimed at reducing emissions of both ROC and NOx. The 2010 Clean Air Plan EIR included an analysis of potential impacts related to amendments to Rule 360. At this point, it is anticipated that the proposed Rule 360 amendments will be within the scope of the 2010 Clean Air Plan EIR, and that no additional analysis is required under the California Environmental Quality Act (CEQA). A CEQA determination will be made when the proposed rule amendments are brought to the District Board for adoption. Any subsequent changes to the project description during the public review period will undergo additional environmental review under CEQA if it is determined that the changes are outside the scope of the 2010 Clean Air Plan EIR and its associated addendums.

# 7. PUBLIC REVIEW

Workshops

The District will hold a public workshop to present, discuss, and hear comments on the draft rule and draft staff report on November 1, 2017 in Santa Barbara. The draft rule and draft staff report will be made available on the District's website prior to the public workshop, and there will be a two-week comment period after the public workshop. A public notice will be placed in the Santa Barbara News Press on October 8, 2017 to notify the public about these events and to encourage participation in the public process. Also, the public notice will be distributed to all permitted facilities that own or operate a boiler, water heater, or process heater, as well as to all the manufacturers listed on the SCAQMD list of certified units. And finally, the public notice will be distributed to all stakeholders who signed up to receive rule updates from our website.

Comments received during the workshop and during the commenting period following the workshop will be considered and incorporated into the proposed amendments to Rule 360, as appropriate.

Community Advisory Council

To facilitate the participation of the regulated community and the public in the development of the District's regulatory program, the District created the Community Advisory Council (CAC). The CAC is comprised of representatives appointed by the District's Board of Directors. Its charter is, among other things, to review proposed changes to the District's Rules and Regulations and make recommendations to the Board of Directors on these changes.

The CAC will meet and discuss the amendments to District Rule 360.

Public Hearing

In accordance with H&SC Section 40725, the proposed amendments to Rule 360 will be publicly noticed and made available on the District's website prior to the public hearing. The public will be invited to provide comments prior to the public hearing for the adoption of the proposed rule amendments.

# 8. REFERENCES


1) South Coast Air Quality Management District – Rule 1146.2 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters), Amended May 5, 2006.
2) South Coast Air Quality Management District – *Staff Report for Proposed Amended Rule 1146.2 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters),* April 2006.
3) South Coast Air Quality Management District – Rule 1146.2 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters) – List of Certified Units, Updated July 7, 2017.
4) San Joaquin Valley Air Pollution Control District – Rule 4308 (Boilers, Steam Generators, and Process Heaters), Amended November 14, 2013.
5) San Joaquin Valley Air Pollution Control District – *Staff Report for Rule 4308 (Boilers, Steam Generators, and Process Heaters),* October 15, 2013.
6) San Joaquin Valley Air Pollution Control District – *Staff Report for Rule 4308 (Boilers, Steam Generators, and Process Heaters),* November 5, 2009.
7) Ventura County Air Pollution Control District – *Staff Report for Rule 74.11.1 (Large Water Heaters and Small Boilers),* May 10, 2012
8) Sacramento Metropolitan Air Quality Management District – *Staff Report for Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu per Hour),* January 15, 2010
9) Bay Area Air Quality Management District – Regulation 9, Rule 6 (Nitrogen Oxides Emissions From Natural Gas-Fired Boilers and Water Heaters), Amended November 7, 2007.


# 9. ATTACHMENTS

## 9.1 Attachment A. FAQs and Rule Clarification

# ATTACHMENT A

# FAQs and Rule Clarification

# FAQs and Rule Clarification

The following text provides rule clarifications in the format of frequently asked questions:

1. **Question:** What types of units are considered "Process Heaters," as defined in the rule?

   **Response:** Any type of unit where the products of combustion do not come in contact with the process stream. The following types of units are considered process heaters:
   - Heated Process or Storage Tanks
   - Heater Treaters
   - Thermal Fluid Heaters
   - Asphaltic Oil Tank Heaters
   - Glycol Dehydrators
   - Amine Reboilers
   - Propane Vaporizers
   - Absorption Chillers

2. **Question:** What types of units are NOT considered "Process Heaters," as defined in the rule?

   **Response:** Any type of unit where the products of combustion come in contact with the process stream. The following types of units are not considered process heaters:
   - Afterburners, Flares, Thermal Oxidizers, or Degassing Units
   - Evaporators, Fryers, Metal Heat Treating or Metal Melting Furnaces, Metal Pots, or Tar Pots
   - Ovens, Dryers, Kilns, Calciners, Cookers, or Roasters
   - Crematories or Incinerators
   - Make-Up Air Heaters, such as on a Spray Booth
   - Humidifiers
   - Tenter frame, fabric, or carpet dryers

3. **Question:** Can instantaneous water heaters meet the new 20 ppm limit?

   **Response:** Yes, instantaneous water heaters can meet the new limit. These types of units had difficulties in reaching the 20 ppm limit because manufacturers used to use partial premix burners. However, manufacturers are now using fully premixed burners or multiple modulating burners to achieve finer control and lower emissions.

4. **Question:** The boiler that my company is proposing to install is certified by the SCAQMD Rule 1146.2 for natural gas. However, my company will be firing the boiler on propane. Does the certification still apply?

   **Response:** Yes, the District will accept the certification for the propane fired unit as long as the model of the boiler is on the SCAQMD certification list.

5. **Question:** Is there a fee for the application or certification process to have my unit Rule 360 unit certified with the Santa Barbara County APCD?

   **Response:** There is no additional fee to submit an application to certify a unit under Rule 360.

6. **Question:** I'm planning on installing two 1.8 MMBtu/hr natural gas-fired boilers together. Are they subject to Rule 360?

   **Response:** Yes, the boiler rule that applies is determined based on the size of each individual unit. In this scenario, both units would be subject to the Rule 360 standards.

   As for the permitting requirements, that question relates to "stacking," which is a permitting issue only. If a company installs two 1.8 MMBtu/hr boilers and the system is designed such that both units may be operated concurrently (i.e., the design heat input is greater than 2.0 MMBtu/hr), then a permit is required. If the second unit is solely a backup unit and the design criteria for the system is less than 2.0 MMBtu/hr, then a permit will not be required.