

## **APPENDIX F**

### **Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) Analyses For Proposed Amendments to Rule 4702**

July 20, 2021

**SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT**

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**I. BACKGROUND:**

Sections 182(b)(2) and 182(f) of the federal Clean Air Act require ozone nonattainment areas to implement RACT for sources that are subject to Control Techniques Guidelines (CTG) documents issued by EPA and for “major sources” of VOCs and NO<sub>x</sub>, which are ozone precursors. RACT can be defined as devices, systems, process modifications, or other apparatus or techniques that are reasonably available, taking into account the necessity of imposing such controls in order to attain and maintain a national ambient air quality standard (NAAQS); the social, environmental, and economic impact of such controls; and alternative means of providing for attainment and maintenance of such a standard. These control techniques, which are defined in EPA guidelines for limiting emissions from existing sources in nonattainment areas, are adopted and implemented for nonattainment areas by state analysis.

In November 2015, EPA published the Technical Support Document (TSD)<sup>1</sup> for the current version of Rule 4702 in conjunction with EPA’s full approval of the rule for inclusion into the State Implementation Plan (SIP). As published in the Federal Register, EPA determined that the requirements of Rule 4702, to be, “consistent with EPA regulations, and relevant policy and guidance regarding enforceability, BACM/BACT, RACM/RACT, and SIP relaxations.”<sup>2</sup> The TSD published in November 2015 for *EPA’s Proposed Rulemaking for the California State Implementation Plan - San Joaquin Valley Unified Air Pollution Control District Rule 4702 Internal Combustion Engines* states “The submitted Rule 4702 strengthens the SIP... For the reasons discussed above, we propose to find that the emission limits in Table 1, Table 3, and Table 4 of Rule 4702 and related compliance requirements implement BACM for this source category at this time.”<sup>3</sup> Additionally, on November 15, 2018, the District adopted the District’s 2018 Plan for the 1997, 2006, and 2012 PM<sub>2.5</sub> ambient air quality standards to satisfy the Clean Air Act (CAA) requirements for these standards. As a part of the 2018 PM<sub>2.5</sub> Plan, the District demonstrated that Rule 4702 continued to satisfy BACM and performed a Most Stringent Measures (MSM) analysis for all rules that contain emission limits or requirements for NO<sub>x</sub> or PM. EPA defines MSM as, “*the maximum degree of emission reductions that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states and that can feasibly be implemented in the area.*” MSM is addressed on a pollutant-by-pollutant basis and is more stringent than RACT and BARCT. In the

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<sup>1</sup> Technical Support Document for EPA’s Notice of Proposed Rulemaking and Direct Final Rule for the California State Implementation Plan – San Joaquin Valley Unified Air Pollution Control District Rule 4702 (Internal Combustion Engine) November 2015.

<sup>2</sup> Revisions to the California State Implementation Plan, San Joaquin Valley Air Pollution Control District and Sacramento Metropolitan Air Quality management District, 73 Fed. Reg. 7, pp. 1818 – 1822. (2008, January 10).

<sup>3</sup> Technical Support Document for EPA’s Proposed Rulemaking for the California State Implementation Plan - San Joaquin Valley Unified Air Pollution Control District Rule 4702 Internal Combustion Engines. (November 2015).

Technical Support Document - EPA Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQS<sup>4</sup> (February 2020), EPA also determined that Rule 4702 implemented BACM and MSM for IC engines.

As discussed above, EPA has determined that the requirements of Rule 4702 satisfy MSM and BACM (Best Available Control Measures)/BACT (Best Available Control Technology), which are a higher level of control than RACT. Since the full approval of the current version of Rule 4702 by EPA, emissions control technology for stationary internal combustion engines has not changed significantly; therefore, the proposed amendments to Rule 4702 to make existing emissions limitations more stringent will clearly continue to exceed RACT.

## **II. Best Available Retrofit Control Technology (BARCT) Requirements**

Most existing stationary sources in California non-attainment areas, such as the San Joaquin Valley, have been subject to Best Available Retrofit Control Technology (BARCT) requirements since the 1980s. California Health and Safety Code (CH&SC) Section 40406 defines BARCT as follows:

*Best Available Retrofit Control Technology (BARCT) is an air emission limit that applies to existing sources and is the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source.*

In September of 2017, the California State Legislature and Governor passed Assembly Bill 617 (AB 617)<sup>5</sup>, Non-vehicular Air Pollution: Criteria Air Pollutants and Toxic Air Contaminants. One requirement of AB 617 is for California air districts located in non-attainment areas to perform a Best Available Retrofit Control Technology (BARCT) analysis of their existing rules and regulations, and if applicable, propose an expedited schedule for revising rules that are found to not meet BARCT requirements by no later than December 31, 2023. AB 617 requires the expedited BARCT implementation schedule to apply to each industrial source that, as of January 1, 2017, was subject to the Cap-and-Trade program and gives the highest priority to those permitted units that have not modified emissions-related permit conditions for the greatest period of time. AB 617 also recognizes that “Existing law also authorizes a district to establish its own best available retrofit control technology requirement based upon the consideration of specified factors.”

As discussed above, the District and EPA have determined that the current requirements of Rule 4702 satisfy MSM and BACM/BACT for NOx and PM precursors,

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<sup>4</sup> Technical Support Document - EPA Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQS (February 2020)

<sup>5</sup> AB 617, Garcia, C., Chapter 136, Statutes of 2017.

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which require a more stringent level of control than BARCT; therefore, the current Rule 4702 emission limits for NO<sub>x</sub> and PM precursors also satisfy BARCT requirements.

As stated above, AB 617 requires air districts located in non-attainment areas to perform a BARCT analysis of their existing rules and regulations. Because the San Joaquin Valley Air District is classified as attainment for SO<sub>x</sub> and CO, a BARCT analysis is not required for these pollutants. Therefore, the BARCT analysis for Rule 4702 was limited to evaluating the VOC emission limits and requirements included the rule.

The District is proposing to amend Rule 4702 to establish a VOC limit of 90 ppmv @ 15% O<sub>2</sub> (referenced as methane) for all spark-ignited IC engines subject to the rule requirements. This VOC emission limit was selected because it represents a well-controlled level that can be achieved without adversely impacting the ability of affected IC engines to achieve the NO<sub>x</sub> emissions reductions required by the rule. The proposed 90 ppmv VOC limit will significantly reduce the current VOC emission limits in Rule 4702 of 250 ppmv for rich-burn IC engines and 750 ppmv for lean-burn IC engines and, as discussed below, will be considerably lower than the VOC limits contained in the rules of almost all other California air districts that apply to IC engines.

## A. OTHER AIR DISTRICTS

To ensure that the proposed VOC emission limits in Rule 4702 satisfy BARCT, the District compared the proposed emission limits to the requirements of other rules and regulations that apply to IC engines in other California air districts, and also considered applicable State regulations and Federal New Source Performance Standards for IC engines.

The requirements of the following rules and regulations were compared to the proposed VOC limits in Rule 4702 to ensure that the proposed VOC limits satisfy BARCT.

- California Environmental Protection Agency Air Resources Board Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Stationary Spark-Ignited Internal Combustion Engines (November 2001)
- Antelope Valley AQMD Rule 1110.2 - Emissions from Stationary, Non-Road and Portable Internal Combustion Engines (9/18/2018)
- Bay Area AQMD Regulation 9, Rule 8 – Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines (7/25/2007)
- Feather River AQMD Rule 3.22 – Stationary Internal Combustion Engines (8/3/20)
- Mojave Desert AQMD Rule 1160 - Internal Combustion Engines (1/22/2018)
- Sacramento Metropolitan AQMD Rule 412 – Stationary Internal Combustion Engines at Major Stationary Sources of NO<sub>x</sub> (6/1/1995)
- South Coast AQMD Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines (11/1/2019)

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- Ventura County APCD Rule 74.9 – Stationary Internal Combustion Engines (11/8/2005)
- 40 CFR 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
- 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The applicable VOC requirements of the regulations listed above are summarized below.

- *California Environmental Protection Agency Air Resources Board Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Stationary Spark-Ignited Internal Combustion Engines (November 2001)*

This document presents CARB's determination of RACT and BARCT for NO<sub>x</sub>, VOC, and CO emissions from stationary, non-emergency, spark-ignited, reciprocating IC engines with a rated power of 50 bhp or greater. The RACT and BARCT determination was developed by CARB staff and representatives of California air districts. There have been no updates to this determination since it was adopted.

This document indicates that CARB determined that VOC limits of 250 ppmv @ 15% O<sub>2</sub> and 750 ppmv @ 15% O<sub>2</sub> were BARCT for rich-burn spark-ignited IC engines and lean-burn spark-ignited IC engines, respectively. The 90 ppmv @ 15% O<sub>2</sub> VOC limit for spark-ignited IC engines included in the proposed amendments to Rule 4702 is significantly lower than the BARCT limits given in this document.

- *Antelope Valley AQMD (AVAQMD) Rule 1110.2 - Emissions from Stationary, Non-Road and Portable Internal Combustion Engines (9/18/2018)*

The stated purpose of this rule is to limit emissions of NO<sub>x</sub>, VOCs, and CO from IC Engines. This rule was last amended on September 18, 2018. The AVAQMD Rule & Plan Development webpage and 2021 Rule Development List indicate that AVAQMD currently does not have any plans to amend this rule.<sup>6</sup>

AVAQMD Rule 1110.2 requires stationary spark-ignited IC engines to comply with a VOC limit of 250 ppmv @ 15% O<sub>2</sub> and requires portable spark-ignited IC engines to comply with a VOC limit of 240 ppmv @ 15% O<sub>2</sub>.

The 90 ppmv @ 15% O<sub>2</sub> VOC limit for spark-ignited IC engines included in the proposed amendments to Rule 4702 is significantly lower than the VOC limits in this rule.

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<sup>6</sup> <https://avaqmd.ca.gov/rule-plan-development>

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- *Bay Area AQMD (BAAQMD) Regulation 9, Rule 8 – Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines (7/25/2007)*

The purpose of BAAQMMD Regulation 9, Rule 8 is to limit the emissions of NO<sub>x</sub> and CO from stationary internal combustion engines with an output rated by the manufacturer at more than 50 brake horsepower. The BAAQMD Rule Development webpage<sup>7</sup> and the BAAQMD Industrial Cap-and-Trade Sources Expedited BARCT Implementation Schedule Final Staff Report<sup>8</sup> indicate that BAAQMD currently does not have any plans to amend this rule.

This rule does not include any limits for VOC emissions from IC engines. Therefore, no discussion of this rule is required.

- *Feather River AQMD (FRAQMD) Rule 3.22 – Stationary Internal Combustion Engines (8/3/20)*

FRAQMD Rule 3.22 applies to stationary IC engines with rated brake horsepower greater than or equal to fifty (>50 bhp) used in industrial, institutional, and commercial operations that operate within the boundaries of the FRAQMD. Agricultural engines at agricultural sources that emit air emissions less than 50% of the major source thresholds for regulated air pollutants and/or HAPs in any 12-month period are exempt from this rule.

FRAQMD Rule 3.22 was last amended on August 3, 2020. The 2020 amendments to FRAQMD Rule 3.22 were required by the FRAQMD Proposed Expedited BARCT Schedule for Industrial Facilities Subject to Cap and Trade in order to address BARCT requirements for NO<sub>x</sub>, VOC, and CO emissions from IC engines.<sup>9</sup>

FRAQMD Rule 3.22 requires stationary spark-ignited rich-burn IC engines to comply with a VOC limit of 250 ppmv @ 15% O<sub>2</sub> and requires stationary spark-ignited lean-burn IC engines and stationary compression-ignited IC engines to comply with a VOC limit of 750 ppmv @ 15% O<sub>2</sub>. FRAQMD determined that the NO<sub>x</sub>, VOC, and CO emission limits included in the rule for spark-ignited IC engines satisfy BARCT.<sup>10</sup>

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<sup>7</sup> <https://www.baaqmd.gov/rules-and-compliance/rule-development>

<sup>8</sup> Bay Area Air Quality Management District Industrial Cap-and-Trade Sources Expedited BARCT Implementation Schedule Final Staff Report (December 2018)  
[https://www.baaqmd.gov/~media/files/ab617-community-health/barct/20181214\\_fsr\\_ab617\\_barct-pdf.pdf?la=en](https://www.baaqmd.gov/~media/files/ab617-community-health/barct/20181214_fsr_ab617_barct-pdf.pdf?la=en)

<sup>9</sup> Feather River Air Quality Management District Proposed Expedited BARCT Schedule for Industrial Facilities Subject to Cap and Trade (December 2018)  
<https://www.fraqmd.org/files/6df1834e6/Expedited+BARCT+Schedule.pdf>

<sup>10</sup> Feather River Air Quality Management District Approval of Regulation III, Rule 3.22 - Stationary Internal Combustion Engines (8/3/2020) <https://www.fraqmd.org/files/c0a94165c/Item+5+Resolution+2020-07+Rule+3.22+Adoption.pdf>

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The 90 ppmv @ 15% O<sub>2</sub> VOC limit for spark-ignited IC engines included in the proposed amendments to Rule 4702 is significantly lower than the VOC limits in this rule, which FRAQMD recently determined satisfy BARCT. The Rule 4702 requirements for compression-ignition IC engines to be Tier 3 or Tier 4 are also more stringent than the VOC emission requirements for compression-ignition IC engines in FRAQMD.

- *Mojave Desert AQMD (MDAQMD) Rule 1160 - Internal Combustion Engines (1/22/2018)*

The purpose of MDAQMD Rule 1160 is to limit emissions of NO<sub>x</sub>, CO, and VOC from IC engines that are not subject to District Rule 1160.1 – Internal Combustion Engines in Agricultural Operations. MDAQMD Rule 1160 applies to stationary IC engines rated at 50 or more brake horsepower (bhp), when located within the MDAQMD Federal Ozone Non-attainment Area. MDAQMD Rule 1160 was last amended on January 22, 2018. The MDAQMD 2021 Rule Development Calendar<sup>11</sup> and the MDAQMD AB 617 BARCT Implementation Schedule<sup>12</sup> indicate that MDAQMD currently does not have any plans to amend this rule.

MDAQMD Rule 1160 requires stationary spark-ignited rich-burn IC engines, stationary spark-ignited lean-burn IC engines, and stationary compression-ignited IC engines to comply with a VOC limit of 106 ppmv @ 15% O<sub>2</sub>, except for stationary IC engines located at the Southern California Gas, Newberry Springs Facility, which must comply with a VOC limit of 255 ppmv @ 15% O<sub>2</sub>.

The VOC limits included in the proposed amendments to Rule 4702 are lower than the VOC limits in this rule and significantly lower than the VOC limits in the rule for stationary IC engines located at the Southern California Gas, Newberry Springs Facility.

- *Sacramento Metropolitan AQMD (SMAQMD) Rule 412 – Stationary Internal Combustion Engines at Major Stationary Sources of NO<sub>x</sub> (6/1/1995)*

The purpose of SMAQMD Rule 412 is to limit emissions of NO<sub>x</sub>, CO, and non-methane hydrocarbons (NMHC) from the operation of stationary IC engines located at major stationary sources of NO<sub>x</sub> that have a potential to emit for NO<sub>x</sub> exceeding 25 tons per year. SMAQMD Rule 412 was adopted June 1, 1995 and has not been amended. The SMAQMD Expedited BARCT Implementation Schedule for AB 617<sup>13</sup> indicates that SMAQMD Rule 412 may be amended in 2022 to ensure that the rule satisfies the

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<sup>11</sup> MDAQMD Rule Development Calendar 2021

<https://www.mdaqmd.ca.gov/home/showpublisheddocument/8579/637441416419300000>

<sup>12</sup> Mojave Desert AQMD AB 617 BARCT Implementation Schedule (2019)

<https://www.mdaqmd.ca.gov/home/showdocument?id=6098>

<sup>13</sup> Sacramento Metropolitan AQMD Expedited BARCT Implementation Schedule for Assembly Bill 617 (October 2018)

[http://www.airquality.org/ProgramCoordination/Documents/Item1\\_102518\\_AB617\\_BARCT\\_Schedule.pdf](http://www.airquality.org/ProgramCoordination/Documents/Item1_102518_AB617_BARCT_Schedule.pdf)

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BARCT requirement for NO<sub>x</sub> from IC engines.<sup>14</sup> At this time SMAQMD has not held any workshops to discuss potential amendments to the rule.

SMAQMD Rule 412, Section 302 – BARCT Emission Limits requires stationary spark-ignited rich-burn IC engines subject to the rule to comply with a NMHC limit of 250 ppmv @ 15% O<sub>2</sub> and requires stationary spark-ignited lean-burn IC engines and stationary compression-ignited IC engines subject to the rule comply with a NMHC limit of 750 ppmv @ 15% O<sub>2</sub>.

The VOC limits included in the proposed amendments to Rule 4702 are significantly lower than the NMHC limits in this rule. In addition, the emission requirements of Rule 4702 are also significantly more stringent in terms of applicability. With the exception of emergency IC engines and low-use IC engines that are infrequently used, stationary IC engines rated greater than 50 bhp and transportable IC engines rated greater than 50 bhp at stationary sources in the San Joaquin Valley are generally subject to the requirements of Rule 4702, while the SMAQMD Demonstration of Reasonably Available Control Technology for the 2008 Ozone NAAQS (RACT SIP) (January 23, 2017)<sup>15</sup> indicates that there were only five lean-burn, spark-ignited, IC engines subject to SMAQMD Rule 412.

- *South Coast AQMD (SCAQMD) Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines (11/1/2019)*

SCAQMD Rule 1110.2 applies to stationary and portable IC engines rated more than 50 bhp. The purpose of SCAQMD Rule 1110.2 is to reduce NO<sub>x</sub>, VOC, and CO emissions from IC engines. SCAQMD Rule 1110.2 was last amended on November 1, 2019. The 2019 amendments to SCAQMD Rule 1110.2 required IC engines that are in SCAQMD's Regional Clean Air Incentives Market (RECLAIM) and currently exempt from the NO<sub>x</sub> emission limits in the rule to comply with these emission limits in accordance with the schedule established in SCAQMD Rule 1100 – Implementation Schedule for NO<sub>x</sub> Facilities.<sup>16</sup> SCAQMD determined that no changes were needed for the existing NO<sub>x</sub>, VOC, and CO emission limits in the rule to satisfy BARCT.

SCAQMD Rule 1110.2 limits VOC emissions from most stationary IC engines to no more than 30 ppmv @ 15% O<sub>2</sub>. SCAQMD Rule 1110.2 also includes limits as low as

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<sup>14</sup> Sacramento Metropolitan AQMD Expedited BARCT Implementation Schedule for Assembly Bill 617 (October 2018)

[http://www.airquality.org/ProgramCoordination/Documents/Item1\\_102518\\_AB617\\_BARCT\\_Schedule.pdf](http://www.airquality.org/ProgramCoordination/Documents/Item1_102518_AB617_BARCT_Schedule.pdf)

<sup>15</sup> Sacramento Metropolitan Air Quality Management District Demonstration of Reasonably Available Control Technology for the 2008 Ozone NAAQS (RACT SIP) (January 23, 2017),

<http://www.airquality.org/ProgramCoordination/Documents/RACT%20SIP%20RACTSipReport%20032317%20Item%204.pdf>

<sup>16</sup> South Coast AQMD Final Subsequent Environmental Assessment and Amend Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines and Rule 1100 – Implementation Schedule for NO<sub>x</sub> Facilities (November 1, 2019) <http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2019/2019-nov1-028.pdf?sfvrsn=6>

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10 ppmv VOC @ 15% O<sub>2</sub> for new non-emergency IC engines powering electrical-generators. The SCAQMD Rule 1110.2 emission limits for new non-emergency IC engines powering electrical-generators do not apply to existing IC engines. SCAQMD has determined that the current stringent emission limits in SCAQMD Rule 1110.2 are equivalent to the Best Available Control Technology (BACT) requirements of New Source Review<sup>17</sup> and also previously determined that the current emission requirements of SCAQMD Rule 1110.2 satisfied Lowest Achievable Emission Rate (LAER) requirements of Federal NSR for a digester gas-fired IC engine.<sup>18</sup> A comparison of BACT requirements for VOC from IC engines in other California air Districts further supports that the VOC limits in SCAQMD Rule 1110.2 are at levels equivalent to BACT. For example, the District's previous BACT guideline for fossil fuel-fired IC engines (District BACT Guideline 3.3.12) identified 25 ppmv VOC @ 15% O<sub>2</sub> as achieved in practice BACT for spark-ignited fossil fuel-fired IC engines. SMAQMD had also identified 25 ppmv VOC @ 15% O<sub>2</sub> as achieved in practice BACT for spark-ignited IC engines, excluding biogas fueled engines and electrical generating engines,<sup>19</sup> and BAAQMD identifies 25 ppmv VOC @ 15% O<sub>2</sub> as achieved in practice BACT for rich-burn natural gas-fired IC engines and 32 ppmv VOC @ 15% O<sub>2</sub> as achieved in practice BACT for lean-burn natural gas-fired IC engines.<sup>20</sup> The SCAQMD determinations that the SCAQMD Rule 1110.2 VOC emission limits are equivalent to BACT and LAER and the comparison of these limits to the BACT requirements for VOC from IC engines in other California air districts make it clear that the VOC emission limits of SCAQMD Rule 1110.2 go beyond what is required for BARCT.

In addition, when considering low VOC emission limits for IC engines the potential adverse impact on the ability to comply with low NO<sub>x</sub> limits must be considered. The majority of spark-ignited IC engines that are subject to Rule 4702 are rich-burn IC engines that utilize NSCR to comply with the rule limits. When using NSCR systems to reduce emissions, an air-fuel ratio controller and oxygen sensor are used to precisely control the amount of oxygen in the engine's exhaust so that the NSCR system

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<sup>17</sup> South Coast Air Quality Management District Best Available Control Technology Guidelines (February 1, 2019), Part D: BACT Guidelines for Non-Major Polluting Facilities, I.C. Engine, Stationary, Non-Emergency, Non-Electrical Generators and I.C. Engine, Stationary, Non-Emergency, Electrical Generators, <http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf>

<sup>18</sup> South Coast Air Quality Management District Best Available Control Technology Guidelines (February 2, 2018), Part B: LAER/BACT Determinations for Major Polluting Facilities, Section I - South Coast AQMD LAER/BACT Determinations, Application No. 546360, I.C. Engine, Digester Gas Fired (April 4, 2017), [http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18\\_laer\\_ocsd\\_biogasice.pdf?sfvrsn=12](http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18_laer_ocsd_biogasice.pdf?sfvrsn=12)

<sup>19</sup> Sacramento Metropolitan Air Quality Management District BACT Clearinghouse (Last updated May 7, 2020), BACT Determination Number 143, IC Engine Prime Power [http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-\(bact\)](http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-(bact))

<sup>20</sup> Bay Area Air Quality Management District BACT/TBACT Workbook Section 2, Internal Combustion Engines, I. C. Engine - Spark Ignition, Natural Gas Fired Rich Burn Engine (May 7, 2003) and I. C. Engine - Spark Ignition, Natural Gas Fired Lean Burn Engine (May 7, 2003) <https://www.baaqmd.gov/~media/files/engineering/bact-tbact-workshop/combustion/96-3-2.pdf?la=en> <https://www.baaqmd.gov/~media/files/engineering/bact-tbact-workshop/combustion/96-3-3.pdf?la=en>

achieves optimal emissions control. The amount of oxygen present in the exhaust affects the ability of the system to reduce NOx and VOC in different ways. Less oxygen in the exhaust will result in lower NOx emissions, but emissions of VOCs and CO will increase because there is not sufficient oxygen to completely oxidize these compounds. Conversely, increased oxygen in the exhaust will reduce VOC and CO emissions, but can significantly increase NOx emissions as more nitrogen compounds are oxidized to form NOx across the catalyst. This tradeoff between NOx and VOC reductions makes it more difficult and expensive to simultaneously achieve low NOx and low VOC emissions. In the San Joaquin Valley air basin, NOx reductions are critical for air quality improvement strategies, while VOC reductions have a much more limited impact on air quality. Therefore, the District's attainment strategies and plans have prioritized NOx reductions over VOC reductions. As mentioned above, BARCT must take into account the "*environmental, energy and economic impacts*" of the source category. Considering the minimal effect that VOC reductions have on air quality improvements in the San Joaquin Valley and the much greater importance of NOx reductions, the SCAQMD Rule 1110.2 VOC emission limit, which is equivalent to BACT as determined by the SCAQMD, is beyond BARCT in the San Joaquin Valley.

- *Ventura County APCD (VCAPCD) Rule 74.9 – Stationary Internal Combustion Engines (11/8/2005)*

VCAPCD Rule 74.9 applies to stationary spark-ignited and diesel internal combustion engines rated at 50 bhp or more, operated on any gaseous fuel, including liquid petroleum gas (LPG), or liquid fuel, and not subject to the provisions of VCAPCD Rule 74.16 – Oilfield Drilling Operations. VCAPCD Rule 74.9 was last amended November 8, 2005. The VCAPCD Rule Development webpage<sup>21</sup> and the VCAPCD BARCT Rule Development Schedule 2019 through 2023<sup>22</sup> indicate that VCAPCD currently does not have any plans to amend this rule.

VCAPCD Rule 74.9 requires stationary spark-ignited rich-burn IC engines subject to the rule to comply with a Reactive Organic Compound (ROC)/VOC limit of 250 ppmv @ 15% O<sub>2</sub> and requires stationary spark-ignited lean-burn IC engines and stationary diesel IC engines subject to the rule comply with an ROC limit of 750 ppmv @ 15% O<sub>2</sub>.

The VOC limits included in the proposed amendments to Rule 4702 are significantly lower than the ROC limits in this rule.

- *40 CFR 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*

<sup>21</sup> [http://www.vcapcd.org/rules\\_division.htm](http://www.vcapcd.org/rules_division.htm)

<sup>22</sup> Ventura County Air Pollution Control District Best Available Retrofit Control Technology Rule Development Schedule 2019 through 2023 (12/11/2018) <http://www.vcapcd.org/pubs/Program/AB-617-Attachment-1-BARCT-Rule-Development-Schedule-V2.pdf>

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The New Source Performance Standards (NSPS) of 40 CFR 60 Subpart IIII establishes emission certification requirements for manufacturers of stationary compression-ignition IC engines. 40 CFR 60 Subpart IIII also establishes emission requirements for owners and operators of compression-ignition IC engines for which construction commenced after July 11, 2005 and the engine was manufactured after April 1, 2006 for engines that are not fire pump engines and for owners and operators of compression-ignition IC engines for which construction commenced after July 11, 2005 and the engine was manufactured after July 1, 2006 for engines that were manufactured as certified National Fire Protection Association (NFPA) fire pump engines after July 1, 2006.

40 CFR 60 Subpart IIII requires manufacturers of stationary compression-ignition IC engines to certify that the engines they produce comply with the applicable Tier standards for the engine model year and prohibits owners and operators of stationary compression-ignition IC engines from installing non-emergency IC engines that do not comply with the applicable tier emission standards beginning two years after the applicable emission standard came into effect. The Rule 4702 requirement that non-emergency compression-ignition engines be certified to the applicable Tier standard in effect at the time of installation is equivalent to the emission requirements for stationary non-emergency compression-ignition IC engines in 40 CFR 60 Subpart IIII.

- *40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*

40 CFR 60 Subpart JJJJ establishes emission requirements for manufacturers of stationary spark ignition IC engines. 40 CFR 60 Subpart JJJJ also establishes emission requirements for owners and operators of stationary spark ignition IC engines that commence construction after June 12, 2006 where the IC engines are manufactured: on or after July 1, 2007 for engines with a maximum rated power greater than or equal to 500 bhp, except lean-burn engines with a maximum engine power greater than or equal to 500 bhp and less than 1,350 bhp; on or after January 1, 2008, for lean-burn engines with a maximum rated power greater than or equal to 500 bhp and less than 1,350 bhp; on or after July 1, 2008, for engines with a maximum rated power less than 500 bhp; or on or after January 1, 2009, for emergency engines with a maximum rated power greater than 19 kW (25 bhp).

40 CFR 60 Subpart JJJJ requires manufacturers of stationary spark-ignition IC engines to certify that the engines they produce comply with the applicable emission standards for the engine model year and requires owners and operators of stationary spark-ignition IC engines to install and operate spark-ignited IC engines that comply with the emission standards included in 40 CFR 60 Subpart JJJJ by specified dates. The emission limits in 40 CFR 60 Subpart JJJJ do not apply to existing engines that were manufactured before the applicable compliance date.

40 CFR 60 Subpart JJJJ requires new landfill gas-fired spark-ignited IC engines, digester gas-fired spark-ignited IC engines, and emergency stationary spark-ignited IC

engines to comply with a VOC limit of 1.0 g/bhp-hr or 86 ppmv @ 15% O<sub>2</sub> as propane (258 ppmv @ 15% O<sub>2</sub> as methane) and requires all other stationary spark-ignited IC engines to comply with a VOC limit of 0.7 g/bhp-hr or 60 ppmv @ 15% O<sub>2</sub> as propane (180 ppmv @ 15% O<sub>2</sub> as methane).

The 90 ppmv @ 15% O<sub>2</sub> (as methane) VOC limit for non-emergency spark-ignited IC engines included in the proposed amendments to Rule 4702 is significantly lower than the VOC limits in this regulation, with the proposed VOC limit in Rule 4702 being half of the most stringent VOC requirement in this regulation. In addition, the VOC limit in Rule 4702 will apply to both existing and new engines rather than just new engines.

**B. BARCT Evaluation Conclusion**

The NO<sub>x</sub> emission requirements included in Rule 4702 satisfy MSM and BACT/BACM requirements, which require a higher level of control than BARCT; therefore, Rule 4702 satisfies BARCT for NO<sub>x</sub>.

The VOC emission requirements included in the proposed amendments to Rule 4702 are significantly lower than the VOC emission limits in the majority of rules that apply to similar source categories in other California air districts, including VOC emission limits that have recently and previously been determined to satisfy BARCT. The only exception being the VOC limits in SCAQMD Rule 1110.2, which as discussed above, are actually BACT levels emission limits that are beyond BARCT.

The 90 ppmv @ 15% O<sub>2</sub> VOC limit for spark-ignited IC engines included in the proposed amendments to Rule 4702 will significantly reduce the VOC limits required for spark-ignited IC engines without potentially adversely affecting the ability to achieve the necessary NO<sub>x</sub> emissions reductions, which are critical to attainment of health-based air quality standards in the San Joaquin Valley. Based on this and the comparison to the requirements in other rules and regulations that apply to IC engines, the District has determined that the VOC emission requirements included in the proposed amendments to Rule 4702 meet or exceed BARCT requirements.

**III. Evaluation of the Requirements for Source Categories in Proposed Rule 4702**

The following paragraphs evaluate the requirements of Proposed Rule 4702 in light of the previous definitions of RACT and BARCT.

**A. Emergency Engines and Low-Use Engines**

District staff is not proposing any changes to the exemption requirements for emergency standby engines and low-use engines. The existing requirements are consistent with CARB RACT/BARCT Determination for Spark-Ignited Engines and CARB Airborne Toxics Control Measures (ATCM). In addition, the ATCM is already being implemented

through the District's process for issuing Permits to Operate. The exemptions as outlined in the current rule represent RACT and BARCT for these sources.

**A. AO Spark-Ignited Engines**

As stated earlier, in conjunction with EPA's full approval of the current version of Rule 4702 for inclusion into the SIP, EPA determined that the requirements of Rule 4702 were consistent with EPA regulations, and relevant policy and guidance regarding enforceability, BACM/BACT, and RACM/RACT. Additionally, as a part of the District's 2018 PM<sub>2.5</sub> Plan, the District demonstrated that Rule 4702 continued to satisfy BACM and determined that the requirements of Rule 4702 satisfied MSM for NO<sub>x</sub> and PM precursors. The criteria for BACM/BACT and MSM are stricter than for RACT and BARCT, Therefore the proposed NO<sub>x</sub> limits of 0.15 g/bhp-hr or 11 ppmv and 0.6 g/bhp-hr or 43 ppmv meets or exceeds RACT and BARCT requirements. As discussed above the proposed VOC limits of the rule also meet or exceed BARCT requirements.

**B. Compression Ignited Engines (AO and non-AO)**

The current standard for a Non-Compression Ignited engine are tier 3 or 4 engines, with the exception of engines 'greater than 500 bhp and greater than or equal to 1,000 annual operating hours' which has a NO<sub>x</sub> limit of 80 ppmv. The proposed amendments would remove the 'greater than 500 bhp and greater than or equal to 1,000 annual operating hours' engine category. District staff is not proposing any changes to the requirements for the other engine categories, or any of the Certified Compression Ignited Engines. The requirements for compression-ignited IC engines in the current rule represent RACT and BARCT for these sources.

**C. Limited-Use Non-AO Spark Ignited Engines (Rich-Burn and Lean-Burn)**

District staff evaluated stationary engines that operate less than 4,000 hours annually and compared the cost effectiveness for the limited-use engines and full-time use engines. Since limited-use engines have fewer emissions on an annual basis, the cost effectiveness for a limited-use engine is higher than for a full-time engine. For this reason, the current rule includes a separate category for limited-use engines. The proposed amendments will reduce the emission limits for limited-use engines to 11 ppmv NO<sub>x</sub> and VOC limit of 90 ppmv, which are the same emission limits as full-time engines and, as discussed earlier, meet or exceed RACT and BARCT.

**D. Waste Gas Fueled Non-AO Spark Ignited Rich-Burn Engines**

The current NO<sub>x</sub> limit in Rule 4702 for non-AO waste gas fueled rich-burn engines is 50 ppmv (at 15% O<sub>2</sub>). Waste Gas Fueled Non-AO Spark Ignited engines can achieve levels of control through the use of waste gas cleanup systems and NSCR. The proposed NO<sub>x</sub> limit of 11 ppmv and VOC limit of 90 ppmv Rule 4702 emission limits for

waste gas-fueled non-AO spark-ignited rich-burn engines are the as the emission limits for full-time engines that are not fueled with waste gas and meet or exceed RACT and BARCT.

**E. Cyclic Loaded Field Gas Fueled Non-AO Spark Ignited Rich-Bun Engines**

As noted earlier in this report, cyclic-loaded, field gas fueled engines can achieve some level of control. The exhaust gas temperature of cyclic loaded engines varies as a function of the engine load. Catalyst chemistry depends on a minimum temperature to be effective. When the cyclic load engine is operating in an engine load range for which the exhaust gas temperature is within the catalyst's effective range, the emissions are well-controlled, but as the engine cycles out of that range NOx control may be reduced. The proposed NOx limit of 11 ppmv and VOC limit of 90 ppmv for cyclic-loaded, field gas fueled non-AO spark-ignited rich-burn engines are the same emission limits as other full-time IC and meet or exceed RACT and BARCT.

**F. 2-Stroke Engines Less than 100 hp Non-AO Spark Ignited Lean-Burn Engines**

The category in Rule 4702 of '2-Stroke Engines less than 100 hp' non-AO spark ignited lean-burn engines has a NOx limit of 75 ppmv (at 15% O<sub>2</sub>). There are no engines in this category, and as such it would be removed from Table 3 of the Rule (Table 5 of this report) and would no longer be considered a category for future engines after the timeline detailed in Section 7.5 of the rule.

**G. Lean-Burn Engine Used For Gas Compression**

Most large natural gas-fired lean-burn IC engines in the region are in natural gas distribution and storage service, and these units can experience frequently changing load conditions. The proposed emission limit is achievable through, low-NOx combustion technology, which includes changes to the engine's timing, enhanced control of the air-fuel ratio and other changes that lower NOx emissions. For this reason, and given the prior approval of the existing emissions limitation as RACT for this category, the proposed emission limits of 40 ppmv NOx and 90 ppmv VOC meets or exceeds RACT and BARCT for this source category.

**H. Waste Gas Fueled Non-AO Spark Ignited Lean-Burn Engines**

The current NOx limit in Rule 4702 for non-AO waste gas fueled lean-burn engines is 65 ppmv or 90% reduction (at 15% O<sub>2</sub>). Waste Gas Fueled Non-AO Spark Ignited engines can achieve levels of control though a tune-up of the engine, or the replacement with either a new lean-burn or rich-burn engine. The proposed NOx limit of 40 ppmv and VOC limit 90 ppmv Rule 4702 emission limits for waste gas-fueled non-AO spark-ignited lean-burn engines meets or exceeds RACT and BARCT.

**I. Non-AO Spark Ignited Engines, Not Listed (Rich-Burn and Lean-Burn)**

The proposed NO<sub>x</sub> emission limit of 11 ppmv for non-AO spark ignited engines is more stringent than RACT since the engines in question would be required to install advanced add-on controls in order to meet the proposed limit. The proposed emission limit goes beyond RACT and also meets or exceeds BARCT for this source category.

**J. Consideration for Prohibitory Rules in Other California Air Districts: South Coast AQMD Rule 1110.2 (Emissions from Gaseous - and Liquid-Fueled Engines)**

In considering what benchmarks to use for RACT and BARCT, it is important to evaluate other emission limits that have been imposed on the same source category. The only California air district rule covering the same source category that was found to have potentially more stringent NO<sub>x</sub> or VOC emission limits than those proposed in Rule 4702 was South Coast AQMD (SCAQMD) Rule 1110.2. District staff reviewed SCAQMD Rule 1110.2, which applies to IC engines. SCAQMD Rule 1110.2 includes stringent NO<sub>x</sub>, CO, and VOC emission limits for IC engines. As discussed above, SCAQMD has determined that the current emission requirements of SCAQMD Rule 1110.2 are equivalent to BACT. The SCAQMD emission limits for NO<sub>x</sub> and VOC are also comparable to the emission limits required as BACT in several other California air districts. Because the SCAQMD Rule 1110.2 emission limits are equivalent to BACT, these emission limits go far beyond what is required by RACT and BARCT in the San Joaquin Valley. However, the District has still adopted a similar NO<sub>x</sub> limit for the majority of sources subject to Rule 4702 and is proposing to significantly lower the VOC emission limit in the rule to levels that will be lower than the levels required by rules in almost all other California air districts with the exception of SCAQMD.

It also must be noted that the SCAQMD's Regional Clean Air Incentives Market (RECLAIM) program currently exempts IC engines at RECLAIM facilities from the NO<sub>x</sub> emission limits of SCAQMD Rule 1110.2. Although the recent amendments to SCAQMD rules set a schedule for IC engines at RECLAIM facilities to comply with SCAQMD Rule 1110.2 by December 31, 2023, currently many facilities in the SCAQMD remain exempt from the requirements of the rule. Therefore, the emission limits of SCAQMD Rule 1110.2 cannot be directly compared to limits in District rules that do not have similar exemptions to the rule requirements. Also, even when the SCAQMD RECLAIM facilities begin to comply with the SCAQMD Rule 1110.2, it does not change the fact that the emission limits in the rule are beyond RACT and BARCT and more comparable to BACT, as discussed above. In addition, the San Joaquin Valley has many IC engines that have different uses than the types of IC engines that are subject to SCAQMD Rule 1110.2; for example, SCAQMD staff previously informed the District that there were only two rich-burn agricultural IC engines and no lean-burn agricultural IC engines operating in SCAQMD. Information from the SCAQMD also indicates that there are no stationary diesel IC engines that are subject to the emission requirements of SCAQMD Rule 1110.2. Therefore, the emission limits in SCAQMD

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Rule 1110.2 have not been demonstrated in practice for several types of IC engines that operate in the San Joaquin Valley, which further supports that the emission limits of SCAQMD Rule 1110.2 are beyond RACT and BARCT for these engines.

## **IV. Conclusion**

Since the previous rule was determined to meet RACT and this amendment further strengthens the rule requirements, this rule is expected to establish requirements well beyond RACT, and thus satisfies RACT. In addition, based on the evaluation of other applicable rules for this source category, District staff concludes that the proposed rule limits fulfill or exceed BARCT requirements for IC engines.

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