# II. SUMMARY OF THE PROPOSED DETERMINATION FOR SPARK-IGNITED IC ENGINES

The provisions of this proposed determination are applicable to all stationary, spark-ignited internal combustion engines with a current or past rating of 50 brake horsepower or greater, or a maximum fuel consumption of 520,000 Btu per hour or greater. This fuel consumption is equivalent to 50 brake horsepower using a default brake specific fuel consumption (BSFC) rating of 10,400 Btu per brake horsepower-hour. For different BSFC ratings, the maximum fuel consumption ratings should be adjusted accordingly. By including engines with past ratings greater than or equal to 50 horsepower, circumvention of the determination's requirements through derating of the engines rated output is avoided. The proposed RACT and BARCT limits for NOx, VOC, and CO are summarized in Tables II-1 and II-2. Different limits apply to spark-ignited rich-burn engines, spark-ignited lean-burn engines, and rich-burn engines using waste gases. Different limits also apply for low fuel consumption engines and high fuel consumption engines. The dividing line between low and high fuel consumption is an annual fuel consumption of 180 million Btu. Gasoline-fueled, spark-ignited engines are required to use California Reformulated Gasoline. The proposed exemptions, administrative requirements, and test methods are listed at the end of this chapter.

For RACT, the limits for low fuel consumption spark-ignited engines can be achieved by leaning the air/fuel mixture. For high fuel consumption spark-ignited rich-burn engines, the limits are expected to be achieved by using catalysts, prestratified charge systems, or by leaning the air/fuel mixture. The limits for high fuel consumption spark-ignited lean-burn engines are expected to be achieved by leaning the air/fuel mixture or by retrofitting with clean-burn controls to allow further leaning of the air/fuel mixture. Alternative approaches would be the retrofit of existing engines with parts used in newer engines designed for low NOx emissions, replacement of the existing engine with a state-of-the-art low-emissions engine fueled by natural gas or propane, or replacement with an electric motor. Examples of retrofit parts used in low emissions engines would include pistons, heads, electronic engine controllers and ignition systems. It may be necessary to check with the engine manufacturer concerning the compatibility of the components being proposed for retrofit on an existing engine.

The BARCT limits for spark-ignited rich-burn engines fueled by waste gas are expected to be achieved by using prestratified charge systems. The low fuel consumption limits are identical to the RACT limits, and identical controls are expected to be used. For high fuel consumption spark-ignited rich-burn engines, the limits for fuels other than waste gases are expected to be achieved by using catalysts. The high fuel consumption spark-ignited lean-burn limits are expected to be achieved by the retrofit of clean-burn controls, although some engines may require the use of selective catalytic reduction (SCR).

The BARCT limits and low/high fuel consumption thresholds reflect a cost-effectiveness threshold of $12 per pound of NOx reduced which is comparable to Sacramento Metropolitan AQMD's threshold of $12 per pound and the South Coast AQMD's threshold of $12.25 per pound. Although the cost-effectiveness for individual engines will generally be lower than $12 per pound, in some individual cases the cost-effectiveness could exceed this figure. The low/high

fuel consumption threshold for spark-ignited engines is based on a 50 horsepower, rich-burn engine with Nonselective Catalytic Reduction (NSCR) operating sufficient hours to attain a cost-effectiveness of $12 per pound of NOx.

These RACT and BARCT limits should be used as guidance. Districts have the flexibility to adopt IC engine rules that differ from this guidance, as long as these differences do not conflict with other applicable statutes, codes and regulations. The districts may adopt internal combustion engine rules after a case-by-case analysis of engines in the district in order to determine a technically feasible and cost effective way to reduce emissions taking into account site-specific situations or conditions. The districts' decisions on control technologies must not conflict with regulatory requirements and statutory obligations such as attainment plans.

The full text of the proposed determination is provided in Appendix A. The technical basis for the proposed emission limits can be found in Chapter IV.

**Table II-1**

**Summary of Proposed RACT Standards for Stationary Spark-Ignited Internal Combustion Engines**

| Spark-Ignited Engine Type[2] | % Control of $NO_X$ | PPMV AT 15% $O_2$[1] | | |
|---|---|---|---|---|
| | | $NO_X$ | VOC | CO |
| Low Fuel Consumption<br>All Fuels | ---- | 350 | 750 | 4,500 |
| High Fuel Consumption<br>Rich-Burn, All Fuels<br>Lean-Burn, All Fuels | <br>90<br>80 | <br>50<br>125 | <br>250<br>750 | <br>4,500<br>4,500 |

1. For NOx, either the percent control or the parts per million by volume (ppmv) limit must be met by each engine. The percent control option applies only if a percentage is listed, and applies only to engines using exhaust controls. All engines must meet the ppmv VOC and CO limits.
2. Low Fuel Consumption refers to an annual fuel consumption of less than 180 million Btu, while High Fuel Consumption refers to an annual fuel consumption of 180 million Btu or greater. This is approximately equivalent to 170,000 standard cubic feet of natural gas or 1,400 gallons of gasoline.

**Table II-2**

**Summary of Proposed BARCT Standards for Stationary Spark-Ignited Internal Combustion Engines**

| Spark-Ignited Engine Type[2] | % Control of $NO_X$ | PPMV AT 15% $O_2$[1] | | |
|---|---|---|---|---|
| | | $NO_X$ | VOC | CO |
| Low Fuel Consumption<br>All Fuels | ---- | 350 | 750 | 4,500 |
| High Fuel Consumption<br>Rich-Burn, Waste Gas Fueled<br>Rich-Burn, All Fuels<br>Lean-Burn, All Fuels | <br>90<br>96<br>90 | <br>50<br>25<br>65 | <br>250<br>250<br>750 | <br>4,500<br>4,500<br>4,500 |

1. For NOx, either the percent control or the parts per million by volume (ppmv) limit must be met by each engine. The percent control option applies only if a percentage is listed, and applies only to engines using exhaust controls. All engines must meet the ppmv VOC and CO limits.
2. Low Fuel Consumption refers to an annual fuel consumption of less than 180 million Btu, while High Fuel Consumption refers to an annual fuel consumption of 180 million Btu or greater. This is approximately equivalent to 170,000 standard cubic feet of natural gas or 1,400 gallons of gasoline.

## ELEMENTS APPLICABLE TO BOTH RACT AND BARCT

### Exemptions

- Engines operated during emergencies or disasters to preserve or protect property, human life, or public health (e.g., firefighting, flood control)
- Portable engines, as defined in Appendix A
- Nonroad engines, as defined by the United States Environmental Protection Agency (U.S. EPA), excluding stationary applications of this engine type
- Engines not used for the distributed generation of electricity, if operated 100 or fewer hours per year
- Emergency standby engines that, excluding period of operation during unscheduled power outages, operate 100 or fewer hours per year
- Engines used in agricultural operations are exempt from permitting.

[**Note**: The permit exemption for engines used in agricultural operations conforms to Health and Safety Code Section 42310(e) which prohibits districts from requiring permits for agricultural engines. However, this prohibition does not preclude districts from controlling agricultural engines in some other manner. Refer to Appendix F.]

### Administrative Requirements

- Emission Control Plan
- Documentation of exemptions
- Inspection and monitoring plan
- System to monitor NOx and $O_2$ continuously for engines >1,000 horsepower and permitted to operate >2,000 hours per year
- Maintain records of inspections and continuous stack monitoring data for two years
- Source test every 8,760 hours of operation or two years, whichever is more frequent
- Conduct source testing at an engine's actual peak load and under the engine's typical duty cycle
- Maintain an operating log which shows, on a monthly basis, the hours of operation, fuel type, and fuel consumption for each engine
- Installation of nonresettable fuel meter and nonresettable elapsed operating time meter

## ELEMENTS APPLICABLE TO BOTH RACT AND BARCT
(continued)

**Test Methods**

- $O_2$: ARB Method 100 or U.S. EPA Method 3A
- NOx: ARB Method 100 or U.S. EPA Method 7E
- VOC: ARB Method 100 or U.S. EPA Method 25A or 25B
- CO: ARB Method 100 or U.S. EPA Method 10

Alternative test methods which are shown to accurately determine the concentration of NOx, VOC, and CO in the exhaust of IC engines may be used upon the written approval of the Executive Officer of the California Air Resources Board and the air pollution control officer.

Nonresettable fuel meters installed on stationary spark-ignited internal combustion engines shall be calibrated periodically per the manufacturers recommendation.