

**SACRAMENTO METROPOLITAN
AIR QUALITY MANAGEMENT DISTRICT**

**BEST AVAILABLE RETROFIT CONTROL TECHNOLOGY (BARCT) ANALYSIS
FOR NATURAL GAS PRODUCTION OPERATIONS**

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BACKGROUND

AB 617 – Community Air Protection Program

California Assembly Bill (AB) 617¹ was signed into law on July 26, 2017. Among its provisions, California Health and Safety Code (HSC) section 40920.6 was amended to require each air district that is a nonattainment area for one or more air pollutants to adopt an expedited schedule for implementation of Best Available Retrofit Control Technology (BARCT). BARCT is defined as “an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source².”

The Sacramento Metropolitan Air Quality Management District (SMAQMD or District) is designated nonattainment for the state and federal ozone standards, the state PM10 standard, and the federal PM 2.5 standard. Therefore, the expedited BARCT schedule applies to the control of these pollutants and their precursors. The expedited BARCT requirement applies to each industrial source subject to the California Greenhouse Gas Cap-and-Trade regulation³. As required by AB 617, a district’s expedited BARCT must be implemented by the earliest feasible date, but no later than December 31, 2023.

On October 25, 2018, the District’s Board of Directors (Board) adopted an expedited schedule to analyze and implement BARCT in Sacramento County. The District identified three industrial sources that are subject to the California Greenhouse Gas (GHG) Cap-and-Trade regulation. Two of these sources, owned by California Resources Production Corporation (California Resources), are natural gas production operations.

This document presents Staff’s analysis of BARCT for natural gas production operations and evaluates whether existing regulatory requirements meet BARCT or a new District rule is necessary.

Existing Requirements for Natural Gas Production Operations

State

Natural gas production operations in California are subject to the California Air Resources Board’s (CARB’s) Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities⁴ (GHG Standards for NG Facilities). The District implements and enforces this regulation through a memorandum of agreement with CARB⁵. Although the regulation was adopted as a measure to reduce GHG emissions, primarily methane, it also reduces volatile organic compound (VOC)

¹ Statutes of 2017, Ch. 136, Sec. 2. AB 617, Christina Garcia.

² HSC § 40406.

³ Title 17, California Code of Regulations (CCR), § 95800 *et seq.*

⁴ Title 17, California Code of Regulations (CCR), § 95665 *et seq.*

⁵ “Memorandum of Agreement Between the California Air Resources Board and the Sacramento Air Quality Management District Regarding Implementation and Enforcement of GHG Standards for Crude Oil and Natural Gas Facilities.” December 2018. [https://ww2.arb.ca.gov/sites/default/files/2019-01/Sacramento Revised MOA.pdf](https://ww2.arb.ca.gov/sites/default/files/2019-01/Sacramento_Revised_MOA.pdf)

emissions as a co-benefit. The methods used to reduce methane emissions also reduce VOC emissions in this industry.

CARB's regulation contains emission limits and maintenance and repair requirements for production equipment, including natural gas wellheads and associated components, pneumatic devices, organic liquid storage tanks, and compressors (reciprocating and centrifugal). Similar industry standards have been shown to be feasible in the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), the Santa Barbara County Air Pollution Control District (SBCAPCD), the South Coast Air Quality Management District (SCAQMD), the Ventura County Air Pollution Control District (VCAPCD), and the Yolo-Solano Air Quality Management District (YSAQMD).

Federal

In 2006, the U.S. Environmental Protection Agency (EPA) promulgated a Control Techniques Guidelines (CTG) document for the Oil and Natural Gas Industry⁶. The CTG contains Reasonably Available Control Technology (RACT) control guidelines and recommendations, specific exemptions, and recommended work practice procedures to reduce VOC emissions from well sites, gathering and boosting stations, fugitive components, compressors, pneumatic controllers, and condensate storage vessels.

Section 182(b)(2) of the federal Clean Air Act (CAA) requires states and districts to implement RACT for the natural gas industry included in the CTG. To satisfy Section 182(b)(2), CARB submitted the GHG Standards for NG Facilities to EPA for approval into the California State Implementation Plan (SIP). The submittal is intended to satisfy the CAA requirements to implement RACT for this source category⁷. As of February 2021, EPA has not acted on CARB's SIP submission.

District

Natural gas production operations in Sacramento County are subject to permit requirements as required by Rule 201 – General Permit Requirements, and new and modified natural gas production operations are subject to Rule 202 – New Source Review. Unless exempt from the permitting thresholds of Rule 201, permitted equipment that triggers the emissions thresholds of New Source Review must use Best Available Control Technology (BACT), which is the most effective emissions control device, emission limit, or technique, singly or in combination, which has been required or used for the same or similar type equipment. Under no circumstances will BACT be determined to be less stringent than the emission control required by any applicable provision of District, state or federal laws or regulation. BACT is at least as stringent as BARCT and often more stringent.

There is no District prohibitory rule that applies to fugitive VOC emissions from the extraction and collection of natural gas, although, as previously mentioned, the District implements and enforces

⁶ U.S. Environmental Protection Agency. *Control Techniques Guidelines for the Oil and Natural Gas Industry*, EPA-453/B-16-001. Washington DC: October 27, 2016.

⁷ California Air Resources Board. *Resolution 18-44 – Submission of California's Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities into the California State Implementation Plan*. October 25, 2018.

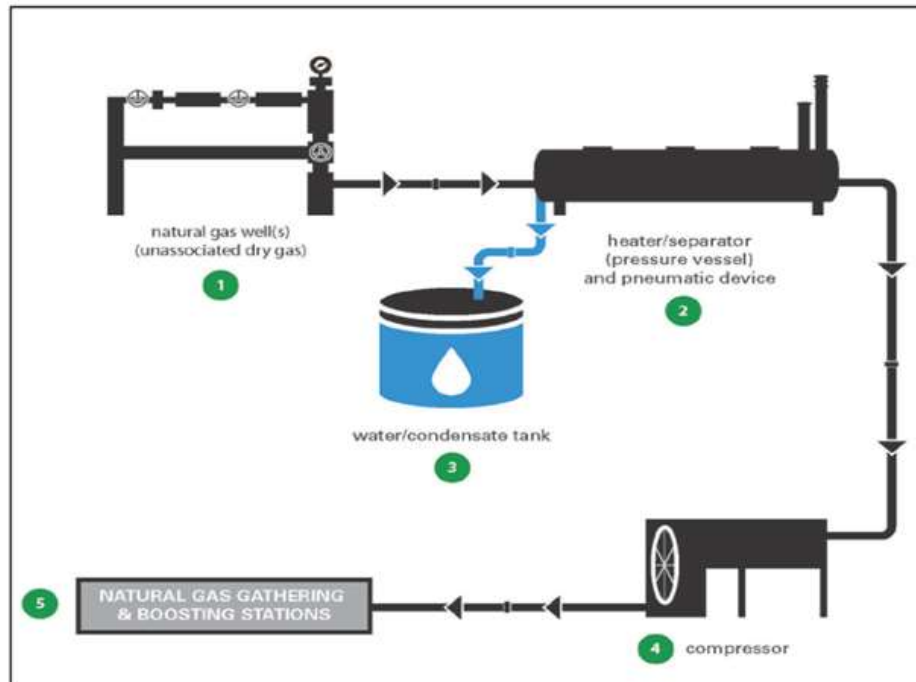
CARB's GHG Standards for NG Facilities. A few associated equipment types used in natural gas production operations may be subject to District prohibitory rules. For example, a limited number of internal combustion (IC) engines in the District are subject to Rule 412 – Stationary IC Engines Located at Major Stationary Sources of NO_x, and some organic liquid storage tanks are subject to Rule 446 – Storage of Petroleum Products. The District will analyze the BARCT requirements for IC engines later as a separate item in the expedited BARCT schedule, currently scheduled for later in 2021.

Natural Gas Production Operations in Sacramento County

Natural gas production operations in Sacramento County are comprised of dry natural gas production wells and associated components, including piping, compressors, dehydrators, condensate storage tanks, and larger compressor stations that transfer produced natural gas into the distribution segment (either production pipeline, underground storage facility, or processing plant).

When natural gas is extracted, the emulsion produced from a well includes gas, water, and condensate; however, condensate is not generally found in large volumes for gas produced in Sacramento County. The natural gas produced in Sacramento County has a very low water content and low VOC content. The emulsion from several wells are routed to a separator where residual condensate is separated out by gravity. The resulting gas is then routed to a compressor to be moved from the production well site to a gathering and boosting station. A diagram of a typical natural gas well is shown in Figure 1.

Figure 1 – Diagram of a Typical Natural Gas Well⁸



CALIFORNIA RESOURCES PRODUCTION CORPORATION FACILITY DESCRIPTION

California Resources is an oil and gas production company that extracts natural gas throughout California. In the Sacramento Valley geological basin (designated Basin No. 730), the company extracts, processes, and compresses natural gas in operations in multiple counties, including Sacramento, Butte, Colusa, Contra Costa, Glenn, San Joaquin, Solano, Sutter, Tehama, and Yolo. The wells in Sacramento produce “dry gas,” that is, the natural gas is at least 85% methane and does not contain liquids associated with crude oil production. It is also often referred to as “pipeline quality.” The natural gas produced in Sacramento County has a VOC content of approximately 1.35%. Under the Cap-and-Trade regulation, all of one company’s oil and gas production operations in the same geological basin are treated as a single “facility.”

The California Resources aggregate “facility” in Sacramento County consists of the following emission sources:

- Internal combustion (IC) prime power engines driving compressors (10 permitted, 18 not permitted): Ten prime power IC engines under permit, each with a manufacturers’ maximum continuous rating greater than 50 brake horsepower (bhp). These engines range in size from 75 bhp to 1680 bhp. The facility operates an additional 18 non-permitted IC engines each with a manufacturers’ maximum continuous rating of 50 bhp or less.

⁸ California Air Resources Board. *Public Hearing to Consider the Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities. Staff Report: Initial Statement of Reasons.* May 31, 2016. p. 20.

Internal combustion engines are used to drive compressors to transport the gas from the wellheads to compressor stations, and finally to a transmission pipeline.

- Glycol dehydration systems (1 permitted and 2 unpermitted): The wet natural gas from underground wells is transferred to a glycol dehydration system to remove water before transferring the gas to a public utility transmission pipeline. The permitted dehydration facility consists of a 0.5 MMBtu/hr reboiler, pump, condenser, and various process storage tanks. The 2 unpermitted units have 375,000 Btu/hr and 100,000 Btu/hr reboilers, respectively. District field staff verified with California Resources⁹ that all three glycol dehydration systems were converted to a closed-loop system to comply with the GHG Standards for NG Facilities. Compliance with the GHG Standards for NG Facilities is accomplished by re-routing the gas from the reboiler vent back into the burner fuel supply.
- Organic liquid storage tanks (8 permitted, 112 not permitted): The storage tanks contain a mixture of natural gas condensate and produced water. Eight organic liquid storage tanks are large enough to maintain a permit with the District. An additional 112 storage tanks are in use at the facility but are not large enough to trigger district permitting requirements.
- Intermittent bleed pneumatic devices (109 non-permitted): Pneumatic devices are used for maintaining a constant pressure, pressure differential, or temperature at natural gas production facilities. Intermittent bleed devices are subject to an emission standard, unless exempt due to throughput, and leak detection and repair (LDAR).
- Separators (145 non-permitted): Separators are used to remove water from the emulsion of the natural gas stream from a wellhead. Separators are subject to LDAR.
- Natural gas production wells (186 non-permitted) and associated components (e.g. connectors, flanges, pipes, and seals): The components at the wellhead are used to extract, collect, and transport natural gas and water. Wellheads and the associated components are subject to LDAR.

CARB'S GREENHOUSE GAS EMISSION STANDARDS FOR CRUDE OIL AND NATURAL GAS FACILITIES

The major requirements of the GHG Standards for NG Facilities are:

- Leak Detection and Repair (LDAR) requirements for active and idle well components (such as pumps, compressors, well heads, valves, flanges, threaded fittings, and connectors), continuous and intermittent bleed natural gas-operated pneumatic devices, and compressor components;
- Collection and control of methane and associated gases from compressors, water separators, and storage tanks;
- Collection of all vented natural gas or replacement of continuous bleed pneumatic devices with no-bleed pneumatic devices; and
- Recordkeeping and reporting requirements.

Although the regulation applies to greenhouse gas emissions (primarily methane in this case), VOCs are also present in natural gas and are emitted through the same mechanisms. For this source category, the control methods used to reduce methane emissions are the same emissions

⁹ Loscher, Chris. "Re: California Resources Production – Natural Gas Glycol Dehydrators." Message to Ali Othman. 30 November 2020. E-mail.

controls used to reduce VOC emissions. The District has not adopted a prohibitory rule covering this emission source category; therefore, any emission reductions of methane from this source will result in a co-benefit of VOC emission reductions.

In establishing the proposed GHG Standards for NG Facilities, CARB considered and evaluated EPA regulations (New Source Performance Standards and the CTG) and the most current air districts rules that are applicable to the crude oil and natural gas production industry. In addition, as part of the SIP submittal, CARB calculated the emissions reduction efficiency of the GHG Standards for NG Facilities and the relevant air district regulations. CARB demonstrated that the GHG Standards for NG Facilities are as stringent or more stringent than existing air district regulations.

LDAR Requirements

The GHG Standards for NG Facilities requires compliance with the LDAR leak thresholds and repair times shown in Table 1 and Table 2¹⁰: Leak detection must be conducted at least once each calendar quarter in accordance with EPA Method 21, which measures the hydrocarbon concentration, calibrated as methane, with the instrument’s sampling probe placed where leakage could occur. Leaking components must be repaired within established time periods, which become shorter as the leak concentrations become greater. CARB initially proposed to allow a facility to reduce the inspection frequency to annually if no leaks are detected for 5 consecutive quarters. However, this allowance was not included in the final regulation because of the possibility of random “super emitter leaks” occurring at any time throughout the calendar year¹¹.

Table 1 – LDAR Allowable Number of Leaks

Leak Threshold (as Methane)	200 or Less Components	More than 200 Components
1,000 – 9,999 ppmv	5	2% of total inspected
10,000 – 49,999 ppmv	2	1% of total inspected
50,000 ppmv or greater	0	0

Table 2 – LDAR Repair Time Periods

Leak Threshold (as Methane)	Repair Time Period
1,000 – 9,999 ppmv	14 calendar days
10,000 – 49,999 ppmv	5 calendar days
50,000 ppmv or greater	2 calendar days
Critical components and Critical process units	Next scheduled shutdown or within 12 months, whichever is sooner

¹⁰ 17 CCR § 95669(i).

¹¹ California Air Resources Board. *Final Statement of Reasons. Regulation for California’s Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities*. May 2017. pp. 91-92.

Reciprocating & Centrifugal Natural Gas Compressors

Reciprocating compressors are used to compress natural gas by using a piston driven by to a crankshaft, which is connected to an engine or electric motor. Small amounts of natural gas may leak during normal operations with a potential for larger leaks caused by worn out or malfunctioning seals. Reciprocating compressors are subject to LDAR and must meet a leak threshold standard of two standard cubic feet per minute (scfm). For compressors that are over the 2 scfm threshold, a vapor collection system is required. An exemption is provided for reciprocating natural gas compressors that operate less than 200 hours per calendar year.

Centrifugal compressors use a rotating disk or impeller to pressurize natural gas for use in a transmission pipeline. Centrifugal compressors are uncommon and account for less than 1% of methane emissions from compressors (including both reciprocating and centrifugal). Staff is not aware of any centrifugal compressors operating in Sacramento County.

Separators and Tank Systems

Separator and tank systems are used to separate condensate and produced water from natural gas streams. In dry natural gas production, the most common system consists of a heated separator used to heat the gas to remove liquids, and a single tank used to store produced water and small amounts of condensate. Separator and tank systems with an annual emission rate greater than 10 metric tons per year of methane must control the emissions with the use of a vapor collection system. A throughput exemption is provided for separator and tank systems used in non-associated gas production that receive an average of less than 200 barrels of produced water per day.

Pneumatic devices

Pneumatic devices are used for maintaining pressure, pressure differential, or temperature at natural gas production facilities. Pneumatic devices operated using natural gas are subject to the GHG Standards for NG Facilities. The options for compliance with the requirements for pneumatic devices are:

1. Replace older continuous bleed natural gas operated pneumatic devices with devices that utilize compressed air or electricity to operate;
2. Conduct LDAR on intermittent-bleed pneumatic devices and maintain devices to prevent any leakage; and
3. Collect vapors from pneumatic pumps or replace natural gas-powered pneumatic pumps with compressed air or electric powered pumps.

BARCT ANALYSIS OF CALIFORNIA'S GREENHOUSE GAS EMISSION STANDARDS FOR CRUDE OIL AND NATURAL GAS FACILITIES

Leak Detection and Repair BARCT Analysis

In addition to CARB's analysis of the GHG Standards for NG Facilities, Staff considered any requirements applicable to the wellheads and associated components, compressors, pneumatic devices, separators, organic liquid storage tanks, and the gas dehydration equipment located at California Resources locations. To evaluate the GHG Standards for NG Facilities as BARCT, Staff

compared the GHG Standards for NG Facilities requirements for LDAR to the air district rules listed in Table 3. Besides LDAR, glycol dehydration pumps in CARB’s GHG Standards for NG Facilities are not allowed to vent natural gas to the atmosphere. For more details of the glycol dehydration vents, see the glycol dehydration system/pumps BARCT Analysis section.

Table 3 identifies the LDAR rules from other air districts that were evaluated and compared with CARB’s GHG Standards for NG Facilities.

Table 3 – Leak Detection and Repair – Other District Rules

District	Rule #	Rule Title	Date
San Joaquin Valley Unified APCD	4401	Steam-Enhanced Crude Oil Production Wells	6/16/2011
San Joaquin Valley Unified APCD	4409	Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities	4/20/2005
Santa Barbara County APCD	331	Fugitive Emissions Inspection and Maintenance	12/10/1991
South Coast AQMD	1148.1	Oil and Gas Production Wells	9/4/2015
South Coast AQMD	1173	Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants	2/6/2009
South Coast AQMD	1176	VOC Emissions from Wastewater Systems	9/13/1996
Ventura County APCD	74.10	Components at Crude Oil and Natural Gas Production and Processing Facilities	3/10/1998
Yolo-Solano AQMD	2.23	Fugitive Hydrocarbon Emissions	8/13/1997

Staff’s review of the LDAR rules did not identify any of the air district rules that are significantly more stringent than CARB’s GHG Standards for NG Facilities. In addition, CARB’s calculations of the VOC emissions reductions from the implementation and enforcement of the GHG Standards for NG Facilities are consistent with the other air district rules.

As part of the SIP submittal, CARB estimated emissions reductions from the LDAR standards of the GHG Standards for NG Facilities and other relevant rules. The estimate emission reductions are shown in Table 4.

Table 4 – LDAR Estimated Emissions Reductions¹²

Regulation	Equipment Type	Estimated VOC Emission Reductions
CARB GHG Standards	LDAR	80%
EPA CTG	LDAR	60 – 75%
Other Air District Rules	LDAR	77 – 83%

¹² California Air Resources Board. *Staff Report: Proposed Submission of California’s Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities into the California State Implementation Plan*. September 21, 2018. pp. 10-11.

The emission reductions of the GHG Standards for NG Facilities are consistent with the air district rules, which range in emission reductions from 77% to 83% for LDAR. The difference in emissions reduction among air district rules is due to the different monitoring frequencies and leak thresholds. For comparison, the leak threshold for all components in the BACT requirement in SCAQMD is 500 ppmv as methane (see BACT review section). A more stringent leak threshold or inspection frequency than the GHG Standards for NG Facilities should be considered beyond BARCT and closer to a BACT requirement.

For a comparison of the LDAR requirements, see the table in Appendix A.

Organic Liquid Storage BARCT Analysis

Staff’s review of the organic liquid storage rules of other California districts did not identify any that are significantly more stringent than CARB’s GHG Standards for NG Facilities. The GHG Standards for NG Facilities requires 95% vapor control efficiency of total emissions (consistent with the CTG) or maintaining VOC emissions less than approximately 1.8 tons per year¹³ (more stringent than the CTG requirement of < 4 tons per year from individual storage vessels).

Table 5 identifies the air districts with organic liquid storage rules that were evaluated and compared with CARB’s GHG Standards for NG Facilities. These rules all require vapor collection systems to reduce emissions by at least 95%.

Table 5 – Organic Liquid Storage

District	Rule #	Rule Title	Date
SMAQMD	446	Storage of Petroleum Products	11/16/1993
San Joaquin Valley Unified APCD	4623	Storage of Organic Liquids	5/19/2005
South Coast AQMD	463	Organic Liquid Storage	11/4/2011
South Coast-AQMD	1178	Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities	4/6/2018
Ventura County APCD	71.1	Crude Oil Production and Separation	6/16/1992
Ventura County APCD	71.2	Storage of Reactive Organic Compound Liquids	9/26/1989
Yolo-Solano AQMD	2.21	Organic Liquid Storage and Transfer	9/14/2016

Glycol Dehydration Systems/Pumps BARCT Analysis

There is no SMAQMD prohibitory rule applicable to glycol dehydration systems/pumps. The GHG Standards for NG Facilities establishes LDAR requirements and restricts the uncontrolled release of vapors from glycol dehydrator systems/pumps. Staff also evaluated SJVUAPCD Rule 4408,

¹³ Ibid. p. 4.

Glycol Dehydration Systems and VCAPCD Rule 71.5, Glycol Dehydrators. These rules limit VOC emissions from glycol dehydrators.

SJVUAPCD Rule 4408 only applies to permitted sources and exemptions are provided for systems that operate less than 200 hours per year or are permitted to dehydrate less than 5 million standard cubic feet of gas per year. VCAPCD Rule 71.5 does not apply to any glycol dehydrator that is operated less than 200 hours per year.

To determine BARCT for NO_x for the reboiler associated with a glycol dehydration system, with a rated heat input of less than 1 MMBtu/hr, Staff evaluated air district rules applicable to boilers, steam generators, and process heaters. Staff did not find any process-specific emission limits for the three reboilers (each with a heat input rating of 0.5 MMBtu/hr or less) operated by California Resources. Some districts, including SMAQMD, have rules that apply to boilers, steam generators, and process heaters below 1 MMBtu/hr but they are point-of-sale rules that apply to units used to produce hot water or steam (typically residential hot water heaters and small commercial hot water heaters). These rules are not applicable to in-use glycol dehydrator reboilers rated 0.5 MMBtu/hr or less and are considered beyond BARCT for the small reboilers operated by California Resources.

BARCT for VOC for the release of vapors is considered compliance with CARB's GHG Standards for NG Facilities. Section 95668(e)(A)(4), Natural Gas Powered Pneumatic Devices and Pumps, does not allow natural gas powered pneumatic pumps to vent natural gas to the atmosphere. To comply with this requirement, California Resources modified each reboiler to re-route the gas vapors coming from the reboiler vent back the reboiler fuel line. Both SJVAPCD Rule 4408 and VCAPCD Rule 71.5 require vapor control of reboiler subject to the rule requirements.

The one permitted glycol dehydrator in Sacramento County emits 0.8 lb/day of VOC. Taken on its own, this unit is exempt from permitting requirements; however, it is subject to permitting as a natural gas production site that includes condensate tanks, IC engines, and separators. The emissions from glycol dehydrators is lower than what is expected due to the near pipeline quality natural gas produced, i.e. a high methane content gas with little condensate. California Resources conducted testing in Sacramento County that showed a VOC content of 1.35% by volume. The two other glycol dehydrators are not yet permitted in Sacramento County due to de minimis emissions.

Other requirements that are applicable to this source category include EPA rules and regulations and Best Available Control Technology (BACT). BACTs from other air districts are provided for reference and are generally considered more stringent than BARCT. The BACT level controls are comparable to BARCT level controls, which further demonstrates that CARB's GHG Standards for NG Facilities are meeting BARCT.

EPA New Source Performance Standards

On May 12, 2016, EPA amended the New Source Performance Standards (NSPS) for Crude Oil and Natural Gas Production, Transmission, and Distribution (40 CFR Part 60 Subpart OOOO) to control methane in addition to VOCs. The update amended NSPS OOOO, created NSPS OOOOa, and expanded the applicability of the NSPS to include pneumatic pumps and controllers, compressors and enhanced LDAR controls. NSPS OOOO applies to onshore oil and gas facilities that are newly constructed, reconstructed, or modified after August 23, 2011, and on or before September 18, 2015. NSPS OOOOa applies to new, modified, and reconstructed sources after

September 18, 2015. The types of facilities covered are natural gas well sites, oil well sites, production gathering and boosting stations, natural gas processing plants, and natural gas compressor stations (transmission and storage).

CARB evaluated the NSPSs and determined that the GHG regulation is generally more stringent and applies to more facilities in California than the NSPSs¹⁴. CARB’s regulation applies to both new and existing facilities where the NSPSs are limited to new and modified sources. The GHG Standards for Crude Oil and Natural Gas Facilities applies to all new and existing natural gas production facilities. Staff concurs with this analysis.

Comparison to Best Available Control Technology (BACT)

BACT is provided for reference and is considered more stringent than BARCT. The BACT level controls are comparable to the controls required by CARB’s GHG Standard for NG Facilities, which further demonstrates that CARB’s regulation meets BARCT.

SMAQMD BACT Determinations: None

SCAQMD BACT Determination:

For fugitive emission sources at natural gas plants and oil and gas production fields:

Table 6 – SCAQMD BACT Determination for Fugitive Emission Sources at Natural Gas Plants and Oil and Gas Production Fields (12-5-2003)

Equipment type	VOC Control Requirements
Valves, fittings, diaphragms, hatches, sight-glasses, open-ended pipes, and meters in VOC service	Compliance with SCAQMD Rule 1173
Compressors, Centrifugal Type	Seal system with a higher-pressure barrier fluid and compliance with SCAQMD Rule 1173
Compressors, Rotary Type	Enclosed seal system connected to closed vent system and compliance with SCAQMD Rule 1173
Pressure Relief Valves	Connected to closed vent system or equipped with rupture disc if applicable and compliance with Rule 1173
Pumps – In Heavy Liquid Service	Single mechanical seal and compliance with SCAQMD Rule 1173
Pumps – In Light Liquid Service	Sealess type if available and compatible; or double or tandem seals, and vented to closed vent system and compliance with Rule 1173
Sampling Connections	Closed-purge, closed-loop, or closed-vent system and compliance with Rule 1173

¹⁴ California Air Resources Board. “Updated Informative Digest. Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities.” July 17, 2017. p.7.

The SCAQMD BACT leak thresholds for LDAR are less stringent than the GHG Standards for NG Facilities when compared on a leak threshold basis. SCAQMD Rule 1173 does not have leak thresholds below 10,000 ppmv for components other than for atmospheric pressure relief devices. The GHG Standards for NG Facilities LDAR leak thresholds are as low as 1,000 ppmv. SCAQMD BACT standards are not more stringent than the current standards in effect in Sacramento County through enforcement of the GHG Standards for NG Facilities.

Santa Barbara County Air Pollution Control District (SBCAPCD) BACT Determination:

Table 7 – SBCAPCD BACT Guide 1.2 – Oil and Gas Fugitive Hydrocarbon Components (11-20-2017)

Equipment Type	VOC Control Requirement
Valves, flanges, pump seals, compressor seals, and other components	LDAR of 100 ppmv or less (as methane)
Pressure relief valves/devices	Pressure relief devices that are vented to vapor recovery system are not subject to LDAR otherwise LDAR of 100 ppmv or less (as methane)
Fugitive inspection and maintenance plan	Compliance with District Rule 331

The SBCAPCD BACT leak thresholds for LDAR are more stringent than the GHG Standards for NG Facilities when compared on a leak threshold basis. The SBCAPCD BACT leak thresholds are more stringent than SBAPCD Rule 331 and, for the purposes of this analysis, the SBAPCD BACT Guide 1.2 standards are considered beyond BARCT.

Table 8 – SJVUAPCD BACT Guideline 7.2.7 – Natural Gas Processing Plant – Valves, Connectors, and Compressor and Pump Seals (8/24/2020)

Equipment Type	VOC Control Requirement
Valves, connectors, flanges, pressure relief device, pump seals, and compressor seals,	Inspection and maintenance program pursuant to District Rule 4409, with the following leak repair thresholds: <ul style="list-style-type: none"> • A dripping rate of more than three (3) drops per minute of liquid containing VOC, or • A reading of methane in excess of 100 ppmv above background when measure per EPA Method 21 for valves, flanges, compressor seals and pressure relief devices, or • A reading of methane in excess of 500 ppmv above background when measure per EPA Method 21 for pump seals.

The SJVUAPCD BACT leak thresholds for LDAR are more stringent than the GHG Standards for NG Facilities when compared on a leak threshold basis. The SJVUAPCD BACT leak thresholds are more stringent than SJVUAPCD Rule 4409 and, for the purposes of this analysis, the SJVUAPCD BACT Guideline 7.2.7 standards are considered beyond BARCT.

CONCLUSION

The District's implementation and enforcement of CARB's GHG Standards for NG Facilities satisfies the AB 617 requirement to implement BARCT for California Resources Production Corporation. No new District rules will need to be adopted for this category.

REFERENCES

California Air Resources Board. *Public Hearing to Consider the Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities. Staff Report: Initial Statement of Reasons.* Sacramento, CA. May 31, 2016.

California Air Resources Board. *Final Statement of Reasons. Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities.* Sacramento, CA. May 2017.

San Joaquin Valley Unified Air Pollution Control District. *Best Available Control Technology (BACT) Guideline 7.2.7 – Natural Gas Processing Plant – Valves, Connectors, and Compressor Pump Seals.* Fresno, CA. August 24, 2020.

Santa Barbara County Air Pollution Control District. *Best Available Control Technology (BACT) Guideline 1.2.* Santa Barbara, CA. November 20, 2017.

South Coast Air Quality Management District. *Best Available Control Technology Guidelines. Part D: BACT Guidelines for Non-Major Polluting Facilities.* Diamond Bar, CA. February 1, 2019.

U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. *Control Techniques Guidelines for the Oil and Natural Gas Industry.* EPA 453/B-16-001. Research Triangle Park, NC. October 2016.

**APPENDIX A
 COMPARISON OF CARB’S GHG STANDARDS FOR CRUDE OIL AND NATURAL GAS FACILITIES WITH OTHER AIR POLLUTION
 CONTROL REQUIREMENTS**

There are no proposed or existing District rules that apply to this source category. Table A-1 contains a comparison of the GHG Standards for Crude Oil and Natural Gas Facilities with other California air district rules related to natural gas production and processing plants.

**Table A-1
 Comparison of LDAR Requirements of CARB GHG Standards for Crude Oil and Natural Gas Facilities and Air District Rules**

Comparative Requirements						
Elements of Comparison	GHG Standards for Crude Oil and Natural Gas Facilities	BAAQMD Rule 8-37	SBCAPCD Rule 331	SCAQMD Rule 1173	SJVUAPCD Rule 4409	YSAQMD Rule 2.23
Applicability	Owners and operators of equipment and components associated with crude oil and natural gas production, natural gas gathering and boosting stations, processing plants, and transmission compressor stations	Natural gas and crude oil production facilities	Components in service at oil and gas production fields, processing plants, and pipeline transfer stations	Components at oil and gas production fields, natural gas processing plants, and pipeline transfer stations	Components containing or contacting VOC streams at light crude oil production facilities, natural gas production facilities and natural gas processing facilities	Oil and gas production and processing facilities, refineries, chemical plants, gasoline terminals, and pipeline transfer stations
Methane exemption	No exemption	Methane in gas stream ≥ 90% by volume	ROC concentration of ≤ 10% by weight	Fluids with VOC content ≤ 10% by weight	VOC content of ≤ 10% by weight	Fluids with VOC concentration ≤ 10% by weight
Leak standards (ppmv as methane)						
Minor gas leak	1,000 – 9,999	> 10,000	> 1,000 to ≤ 10,000	> 10,000 to 50,000	2,000 to 10,000	1,000 to 10,000
Major gas leak	> 10,000	> 10,000	> 10,000	> 50,000	> 10,000	> 10,000
LDAR Inspection frequency						
Audio-visual inspection Manned facilities	Once every 24 hours	No requirement	Once every 8-hour operating period	Once every 8-hour operating period	Once every 24 hours	Once every manned operating shift
Audio-visual inspection Unmanned facilities	Once every 24 hours (if visited) or once a week	No requirement	No requirement	No requirement	Once per week	Once per week
Accessible components	Quarterly	No requirement	Quarterly	Quarterly	Quarterly	Quarterly
Inaccessible components	Annually	No requirement	Annually	Annually	Once every 12 months	Annually
Allowable leaks per inspection period per components inspected	Allowable leaks shown at major gas leak thresholds (lower at minor gas leak thresholds). CARB’s GHG rule requires quarterly LDAR inspections.		Annual LDAR inspection allowed but revert to quarterly inspections if allowable major leaks exceed:	Annual LDAR inspection allowed if allowable major leaks not exceeded and 5 consecutive quarters of operation	Annual LDAR inspection allowed if successful 5 quarters inspections, no NOVs during previous 12 months	Annual LDAR inspection allowed if no major leaks exceeding 0.5% of the total components inspected for 12 months
Valves (≤ 200; > 200)	2; 1% of total inspected		2; 0.5% total inspected	2; 0.5% total inspected	1; 0.5% total inspected	0.5% total inspected
Pump seals (≤ 200; > 200)	2; 1% of total inspected		1; 1% of total inspected	2; 1% total inspected	2; 1% total inspected	0.5% total inspected
Compressor Seals (≤ 200; > 200)	2; 1% of total inspected		1; 1	1; 1	1; 1	0.5% total inspected

Comparative Requirements						
Elements of Comparison	GHG Standards for Crude Oil and Natural Gas Facilities	BAAQMD Rule 8-37	SBCAPCD Rule 331	SCAQMD Rule 1173	SJVUAPCD Rule 4409	YSAQMD Rule 2.23
Pressure relief devices (PRD) (≤ 200; > 200)	2; 1% of total inspected		1; 1	1; 1	1; 1	0.5% total inspected
Other components (≤ 200; > 200)	2; 1% of total inspected		1; 1	1; 1	1; 1	0.5% total inspected
Allowable leak repair periods				Extended repair options	Extended repair options	
Minor gas leak	14 calendar days	24 hours	14 calendar days	7 calendar days (gas leaks > 500 to 10,000 ppmv)	7 calendar days	14 calendar days
Major gas leak ≤ 50,000 ppmv	5 calendar days	24 hours	5 calendar days	2 calendar days (gas leaks > 10,000 to 25,000 ppmv)	3 calendar days	5 calendar days
Major gas leak > 50,000 ppmv	2 calendar days	24 hours	1 calendar day	1 calendar day (gas leaks > 25,000 ppmv)	2 calendar days	1 calendar day
Critical components	Next scheduled shutdown or within 12 months, whichever is sooner	Minimized within 24 hours & replace within 3 months if still exceeds leak standard	Minimized within one hour and replaced next scheduled shutdown or within 12 months, whichever is sooner	n/a	Minimize within one hour and replace during next unit turnaround but no later than one year for date of leak	Minimize and replaced during next process unit turnaround
Reinspection of repaired components	Upon repair	Within one week of repairs	Immediately, 3, or 30 calendar days depending on component	Within 30 days or 14 calendar days for PRDs	Within 15 days	Within 30 days
Multiple repairs of components	5 repair actions within 12-month period shall be replaced and re-measured below leak threshold	n/a	5 repair actions within 12-month period shall be replaced with BACT equipment	5 repair actions within 12-month period shall be replaced with BACT or BARCT equipment	5 repair actions within 12-month period shall be replaced with BACT equipment	5 repair actions within 12-month period shall be replaced with BACT equipment