SMAQMD BACT CLEARINGHOUSE

CATEGORY Type: **BOILER/HEATER < 5 MMBTU**

BACT Category: Small Emitter BACT (PTE < 10 lb/day)

BACT Determination Number:	299	**BACT Determination Date:**	**2/3/2022**

Equipment Information

Permit Number: N/A -- Generic BACT Determination

Equipment Description: BOILER AND WATER HEATERS ONLY

Unit Size/Rating/Capacity: NG ≥ 75,000 Btu/hr & < 2.0 MMBtu/hr

Equipment Location:

EXPIRED

BACT Determination Information

District Contact: Joe Carle Phone No.: (279) 207-1121 email: jcarle@airquality.org

ROCs	**Standard:**	See Technology Description
	Technology Description:	Use good combustion practices
	Basis:	Achieved in Practice
NOx	**Standard:**	See Technology Description
	Technology Description:	Units rated < 1.0 MMBtu/hr must meet 20 ppmvd @ 3% oxygen; Units rated ≥ 1.0 MMBtu/hr must meet 12 ppmvd @ 3% oxygen
	Basis:	Achieved in Practice
SOx	**Standard:**	See Technology Description
	Technology Description:	Use PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H2S)
	Basis:	Achieved in Practice
PM10	**Standard:**	See Technology Description
	Technology Description:	Use PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H2S)
	Basis:	Achieved in Practice
PM2.5	**Standard:**	See Technology Description
	Technology Description:	Use PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H2S)
	Basis:	Achieved in Practice
CO	**Standard:**	See Technology Description
	Technology Description:	Units rated < 0.4 MMBtu/hr must meet 50 ppmvd at 3% oxygen; Units rated ≥ 0.4 MMBtu/hr must meet 100 ppmvd at 3% oxygen
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: This determination does not apply to process heaters or make-up air heaters

Printed: 2/7/2022

SMAQMD BACT CLEARINGHOUSE

CATEGORY Type: **BOILER/HEATER < 5 MMBTU**

BACT Category: Small Emitter BACT (PTE < 10 lb/day)

BACT Determination Number:	300	**BACT Determination Date:**	**2/3/2022**

Equipment Information

Permit Number: N/A -- Generic BACT Determination

Equipment Description: BOILERS AND WATER HEATERS ONLY

Unit Size/Rating/Capacity: LPG ≥ 75,000 Btu/hr & < 2.0 MMBtu/hr

Equipment Location:

EXPIRED

BACT Determination Information

District Contact: Joe Carle Phone No.: (279) 207-1121 email: jcarle@airquality.org

ROCs	**Standard:**	See Technology Description
	Technology Description:	Use of good combustion practices
	Basis:	Achieved in Practice
NOx	**Standard:**	See Technology Description
	Technology Description:	Units rated < 0.4 MMBtu/hr must meet 77 ppmvd @ 3% oxygen; Units rated ≥ 0.4 MMBtu/hr must meet 30 ppmvd @ 3% oxygen
	Basis:	Achieved in Practice
SOx	**Standard:**	See Technology Description
	Technology Description:	Use of good combustion practices
	Basis:	Achieved in Practice
PM10	**Standard:**	See Technology Description
	Technology Description:	Use of good combustion practices
	Basis:	Achieved in Practice
PM2.5	**Standard:**	See Technology Description
	Technology Description:	Use of good combustion practices
	Basis:	Achieved in Practice
CO	**Standard:**	See Technology Description
	Technology Description:	Units rated < 0.4 MMBTU/hr must use good combustion practices;Units rated ≥ 0.4 MMBTU/hr must meet 400 ppmvd @ 3% oxygen
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: This determination does not apply to process heaters or make-up air heaters.

Printed: 2/7/2022

777 12th Street, Ste. 300

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

ADDENDUM TO BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

EXPIRED

DETERMINATION NOS.: 299 & 300

DATE: 02/03/2022

ENGINEER: Joe Carle

Category/General Equip Description: Boiler/Water Heater – Natural Gas or LPG

Equipment Specific Description: #299 – Boiler/water heater greater or equal to 75,000 BTU/hr to less than 2.0 MMBTU/hr, fired on natural gas

#300 – Boiler/water heater greater or equal to 75,000 BTU/hr to less than 2.0 MMBTU/hr, fired on LPG

Equipment Size/Rating: Small Emitter (PTE < 10 lb/day of VOC, NOx, SOx, PM10, or PM2.5 and less than 550 lbs/day of CO)

Previous BACT Det. No.: 218 & 219

Based on the comments received during the public noticing process (Attachment B) this Best Available Control Technology (BACT) determination addendum will update Determinations #299 & 300 to specify the types of units that are applicable to this determination. BACT Determination #299 will apply to only boilers and water heaters greater than or equal to 75,000 BTU/hr to less than 2.0 MMBTU/hr, fired on natural gas while BACT Determination #300 will apply only to the same type and size of units fueled on liquified petroleum gas (LPG). Process heaters and make-up air heaters as defined below are not applicable to BACT Determinations #299 & 300.

Make-up Air Heater: Any unit used to heat incoming air in order to maintain the temperature of a spray booth, container, room or other enclosed space to provide breathable air for a person who may be present during operation.

Process Heater: Any unit which transfers heat from combustion gases to process streams, excluding water or steam.

APPROVED BY: *Brian F Krebs* **DATE:** 2-3-2022

777 12th Street, Ste. 300

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NOS.:	299 & 300
DATE:	02/03/2022
ENGINEER:	Joe Carle

Category/General Equip Description:	Boiler/Heater – Natural gas or LPG
Equipment Specific Description:	#299 – Boiler/heater greater or equal to 75,000 BTU/hr to less than 2.0 MMBTU/hr, fired on natural gas #300 – Boiler/heater greater or equal to 75,000 BTU/hr to less than 2.0 MMBTU/hr, fired on LPG
Equipment Size/Rating:	Small Emitter (PTE < 10 lb/day of VOC, NOx, SOx, PM10, or PM2.5 and less than 550 lbs/day of CO)
Previous BACT Det. No.:	218 & 219

This Best Available Control Technology (BACT) determination will update Determinations #218 & 219 for boilers/heaters greater than or equal to 75,000 BTU/hr and less than 2.0 MMBTU/hr, fired on natural gas or LPG, respectively. For purposes of this determination a boiler is any external combustion equipment fired with natural gas or LPG used to produce hot water or steam. Most boilers in this size range are used for providing general hot water to a large commercial or industrial facility or used for space heating.

The District's Small Emitter and "Otherwise-Exempt Equipment" BACT Determinations policy states that units which are classified as small emitters (less than 10 lbs/day of VOC, NOx, SOx, PM10, or PM2.5 and less than 550 lbs/day of CO) and are located at non-major stationary sources are only required to meet BACT standards that have been achieved in practice. Therefore, this BACT determination will only be based on what is achieved in practice and will be only applied to small emitters at non-major sources. BACT will be evaluated on a case-by-case basis for units that do not fit these criteria.

BACT/T-BACT ANALYSIS

A. ACHIEVED IN PRACTICE (Rule 202, §205.1a):

The following control technologies are currently employed as BACT for boilers/heaters ≥ 75,000 BTU/hr and < 2.0 MMBTU/hr by the following agencies and air pollution control districts:

US EPA

BACT
Source: EPA RACT/BACT/LAER Clearinghouse (See Attachment A)

Two determinations were found for units fueled on natural-gas in this size range.

RBLC ID # MI-0426: Through contact with the permitting agency it was found that the 1.0 MMBTU/hr boilers in this determination were part of a larger project for a PSD modification of a natural gas compressing station. The boilers proposed by the applicant and the standards included in this determination are based on manufacturer data and not through testing. Because the emission standards were not tested and verified in the field, the District does not consider these emission standards achieved in practice.

RBLC ID # SC-0179: The emission standards in this determination for VOC and PM are in units of pounds per hour, which indicate that the standards are based on the specific input rating of the boiler model evaluated and not general standards for this equipment type and size. The EPA clearinghouse also shows that the emission rates are not based on any specific control technology but on the use of natural gas as a fuel and good combustion practices. Other agencies list natural gas usage and good combustion practices as BACT for VOC and PM and, therefore, this determination will be assumed to be equivalent.

No determinations were found for units fueled on LPG for this size range.

RULE REQUIREMENTS: None

California Air Resource Board (CARB)

BACT
Source: CARB BACT Clearinghouse

The only determinations staff found in the CARB BACT Clearinghouse that were not developed by one of the air districts examined later in this determination was SBCAPCD BACT Guidelines 2.1 and 2.2. Through inquiries made by staff to the SBCAPCD regarding the feasibility of the 12 ppmvd NOx standard, it was found that the standard was not being applied to units rated greater than 0.400 MMBtu/hr and less than 1.000 MMBtu/hr. As a result SBCAPCD immediately revised BACT Guideline 2.2 (9/28/21) to require a performance standard of 20 ppmvd at 3% O_2 for this size range. Because the BACT Guideline was updated so recently the CARB BACT Clearinghouse Tool still displays the previous 2017 version.

Natural Gas or LPG Fired Units ≥ 0.075 and < 2.0 MMBTU/hr			
Pollutant	**Size (MMBtu/hr)**	**Standard/Control Technology**	**Source**
VOC	All	Good combustion practices	SBCAPCD BACT 2.1 (6/14/17) & 2.2 (9/28/21)
NOx	≤ 0.400	20 ppmvd at 3% O_2	SBCAPCD BACT 2.1 (6/14/17)
	> 0.400 & < 1.000	20 ppmvd at 3% O_2	SBCAPCD BACT 2.2 (9/28/21)
	≥ 1.000	12 ppmvd at 3% O_2	SBCAPCD BACT 2.2 (9/28/21)
SOx	All	1. Use PUC quality natural gas (A), or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S), and 2. Prepare a Fuel Gas Sulfur Plan (B)	SBCAPCD BACT 2.1 (6/14/17) & 2.2 (9/28/21)
PM10	All	1. Use PUC quality natural gas (A), or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S), and 2. Prepare a Fuel Gas Sulfur Plan (B)	SBCAPCD BACT 2.1 (6/14/17) & 2.2 (9/28/21)
PM2.5	All	1. Use PUC quality natural gas (A), or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S), and 2. Prepare a Fuel Gas Sulfur Plan (B)	SBCAPCD BACT 2.1 (6/14/17) & 2.2 (9/28/21)
CO	≤ 0.400	50 ppmvd at 3% O_2	SBCAPCD BACT 2.1 (6/14/17)
	> 0.400	100 ppmvd at 3% O_2	SBCAPCD BACT 2.2 (6/14/17)

(A) PUC natural gas stands for California Public Utility Commission Quality Natural Gas. California requires that PUC Gas contain no more than 0.25 grains of hydrogen sulfide and no more than 5 grains of total sulfur per 100 scf of gas.

(B) A Fuel Gas Sulfur Plan is a plan that the owners of the equipment prepare outlining how sulfur will be removed to achieve the required standard. This is not required if the unit is fired on PUC natural gas

RULE REQUIREMENTS: None

Sacramento Metropolitan AQMD

BACT

Source: SMAQMD BACT #218 – Boilers ≥ 0.075 and < 2 MMBtu/hr fired on Natural Gas (7/30/19)

Natural Gas-Fired Units ≥ 0.075 and < 2.0 MMBTU/hr		
Pollutant	**Unit Size and Type**	**Standard**
VOC	All	Good combustion practices
NOx	Pool/Spa heaters < 0.4 MMBtu/hr	55 ppmvd at 3% O_2
	All other units	20 ppmvd at 3% O_2
SOx	All	Good combustion practices
PM10	All	Good combustion practices
PM2.5	All	Good combustion practices
CO	≥ 0.4 MMBtu/hr	400 ppmvd @ 3% O_2

Source: SMAQMD BACT #219 – Boilers ≥ 0.075 and < 2 MMBtu/hr fired on LPG (7/30/19)

LPG-Fired Units ≥ 0.075 and < 2.0 MMBtu/hr		
Pollutant	**Unit Type**	**Standard**
VOC	All	Good combustion practices
NOx	Pool/Spa heaters < 0.4 MMBtu/hr	77 ppmvd @ 3% O_2
	All other units	30 ppmvd @ 3% O_2
SOx	All	Good combustion practices
PM10	All	Good combustion practices
PM2.5	All	Good combustion practices
CO	Pool/Spa heaters < 0.4 MMBtu/hr	Good combustion practices
	All other units	400 ppmvd @ 3% O_2

RULE REQIREMENTS:

Rule 414 – Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour (Amended 10/25/2018)

This rule applies to any person who manufactures, distributes, offers for sale, sells, or installs any type of water heater, boiler or process heater with a rated heat input capacity less than 1.0 MMBTU/hr, fired with gaseous or nongaseous fuels. Units must be certified to meet the emission limits by the SMAQMD or SCAQMD. **LPG-fired units are exempt from this rule.**

No person shall distribute, offer for sale, sell, or install any unit that does not meet the following standards:

Heat Input Range and Type	NOx Limit Nanograms per Joule of Heat Output (ppmv @ 3% O_2)*	CO Limit (ppmv @ 3% O_2)
75,000 to < 400,000 Btu/hr Pool/Spa All others	40 (55) 14 (20)	No Limit No Limit
400,000 to 1 million Btu/hr All Types	14 (20)	400

* Where limits are shown in units of both nanograms per joule of heat output and ppmv at 3% oxygen, compliance can be demonstrated using either limit.

Rule 411 – NOx from Boilers, Process Heaters and Steam Generators (Amended 8/23/2007)
This rule applies to units fired on gaseous or nongaseous fuels with a rated heat input capacity of 1 million Btu per hour or greater.

No unit shall exceed the following limits:

Unit Size/Description mmBtu/hr Input	NOx Limit ppmvd @ 3% O_2	CO Limit ppmvd @ 3% O_2
Greater than or equal to 1 and less than 5	30	400

South Coast AQMD

BACT
SCAQMD BACT Guidelines do not contain a determination for boilers/heaters rated 2 MMBTU/hr or less, because these units are not required to obtain a written permit, pursuant to SCAQMD Rule 219.

SCAQMD Rule 219 – Equipment Not Requiring a Written Permit Pursuant to Regulation II (Amended 4/6/2018)
Section (b)(2): Written permits are not required for boilers, process heaters, or any combustion equipment that has a rated maximum heat input capacity of 2,000,000 Btu per hour (gross) or less and are equipped to be heated exclusively with natural gas, methanol, liquefied petroleum gas, or any combination thereof.

RULE REQUIREMENTS:
Reg XI, Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters (Amended 12/7/2018)
This rule is applicable to all natural gas-fired units that have a rated heat input capacity less than or equal to 2,000,000 Btu per hour. Units must be certified to meet the emission limits by the SCAQMD.

New units must meet the following standards:

Category	NOx Limit	CO Limit
Units ≤ 0.4 MMBTU/hr (except pool heaters)	14 nanograms per joule of heat output (20 ppmvd @ 3% O_2)	No standard
Pool heaters ≤ 0.4 MMBTU/hr	40 nanograms per joule of heat output (55 ppmvd @ 3% O_2)	No standard
Units > 0.4 and ≤ 2.0 MMBTU/hr	14 nanograms per joule of heat output (20 ppmvd @ 3% O_2)	400 ppmvd @ 3% O_2

San Joaquin Valley Unified APCD

BACT

SJVUAPCD BACT Guidelines do not contain a determination for boilers rated 5 MMBTU/hr or less, because these units are not required to obtain a written permit, pursuant to SJUVAPCD Rule 2020.

SJVUAPCD Rule 2020 – Exemptions (Amended December 18, 2014)

Section 6.1.1: No Authority to Construct or Permit to Operate shall be required for steam generators, steam superheaters, water boilers, steam cleaners, and closed indirect heat transfer systems that have a maximum input heat rating of 5,000,000 Btu per hour (gross) or less and is equipped to be fired exclusively with natural gas, liquefied petroleum gas, or any combination of the two.

RULE REQUIREMENTS:

SJVUAPCD Rule 4308 – Boilers, Steam Generators, and Process Heaters – 0.075 MMBtu/hr to less than 2.0 MMBtu/hr (Amended 11/14/2013)

This rule applies to any person who supplies, sells, offers for sale, installs, or solicits the installation of any boiler, steam generator, process heater or water heater with a rated heat input capacity of greater than or equal to 75,000 British thermal units per hour and less than 2,000,000 British thermal units per hour.

A person shall not supply, sell, offer for sale, install, or solicit the installation of any boiler, process heater or water heater unless it has been certified pursuant to the standards in the table below.

Type and Size of Unit, in MMBtu/hr	NOx Limit lb/MMBtu of heat input (ppmvd @ 3% O_2)	
	PUC Natural Gas*	Non-PUC Natural Gas or Liquid
Units ≥ 0.075 and ≤ 0.4, except as below	0.024 (20)	0.093 (77)
Units > 0.4 and < 2.0, except as below	0.024 (20)	0.036 (30)
Instantaneous water heaters ≥ 0.075 and ≤ 0.4	0.024 (20)	0.093 (77)

Type and Size of Unit, in MMBtu/hr	NOx Limit lb/MMBtu of heat input (ppmvd @ 3% O_2)	
	PUC Natural Gas*	Non-PUC Natural Gas or Liquid
Instantaneous water heaters > 0.4 and < 2.0	0.024 (20)	0.093 (77)
Pool heaters ≥ 0.075 and ≤ 0.4	0.068 (55)	0.093 (77)
Pool heaters > 0.4 and < 2.0	0.024 (20)	0.036 (30)

* PUC Natural Gas stands for California Public Utility Commission Quality Natural Gas

Units with a rating of ≥ 0.4 MMBtu/hr and < 2.0 MMBtu/hr must meet a standard of 400 ppmvd @ 3% O_2 for CO.

San Diego County APCD

BACT

SDCAPCD BACT Guidelines do not contain a determination for boilers/heaters rated 5 MMBtu/hr or less, because these units are not required to obtain a written permit, pursuant to SDCAPCD Rule 11.

SDCAPCD Rule 11 – Exemptions from Rule 10 Permit Requirements (Amended 5/11/2016)
Section (d)(2)(iv): Any boiler, process heater, or steam generator with a manufacturer's maximum gross heat input rating of less than 5 million BTU per hour fired exclusively with natural gas and/or liquefied petroleum gas.

RULE REQUIREMENTS:

Regulation 4, Rule 69.2.1 – Small Boilers, Process Heaters, and Steam Generators (Adopted 7/8/2020)
This rule applies to any person who manufactures, sells, offers for sale or distributes for use within San Diego County, or installs within San Diego County a new unit (boiler, process heater, or steam generator) with a heat input rating from 75,000 Btu per hour to 2 million Btu per hour.

Effective 7/1/2021 no person shall manufacture, distribute, sell, offer for sale, or install within San Diego County any new unit that exceeds the following emission levels:

Fuel	Unit Type & Heat Input Rating BTU/hr	NOx Limit ppmvd @ 3% O_2	CO Limit ppmvd @ 3% O_2
Natural Gas	75,000 to 400,000 Pool Heaters	55	N/A
Natural Gas	75,000 to 400,000 All Other Units	20	N/A
Natural Gas	> 400,000 to 2,000,000 All Units	20	400
Non PUC Gas or Liquid Fuel	75,000 to 400,000 All Units	77	N/A

Fuel	Unit Type & Heat Input Rating BTU/hr	NOx Limit ppmvd @ 3% O_2	CO Limit ppmvd @ 3% O_2
Non PUC Gas or Liquid Fuel	> 400,000 to 2,000,000 All Units	30	400

Bay Area AQMD

BACT

BAAQMD BACT Guidelines do not contain a determination for boilers/heaters rated 10 MMBTU/hr or less fired exclusively on natural gas or LPG, because units rated less than 10 MMBTU/hr fired exclusively on natural gas or LPG are not required to obtain a permit, pursuant to BAAQMD Rule 2-1.

BAAQMD Regulation 2, Rule 1 – General Requirements (Amended 12/6/2017)

Section 2-1-114: Boilers, heaters, steam generators, duct burners, and similar combustion equipment with less than 10 million BTU per hour rated heat input if fired exclusively with natural gas (including compressed natural gas), liquefied petroleum gas (e.g. propane, butane, isobutene, propylene, butylene, and their mixtures), or any combination thereof are exempt from being required to obtain an Authority to Construct or Permit to Operate.

RULE REQUIREMENTS:

BAAQMD Regulation 9, Rule 6 – Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters (Amended 11/7/2007)

This rule applies to natural gas-fired boilers and water heaters with a rated heat input capacity less than or equal to 2,000,000 BTU/hr. Units must be certified to meet the emission limits by the BAAQMD or SCAQMD.

Rated Heat Input Capacity Btu/hr	Type of Unit	NOx Limit nanograms per joule of heat output (ppm @ 3% O_2)
≤ 75,000	Mobile Home Water Heaters	40
	Other Storage Tank Water Heaters	10
75,001 to 400,000	Mobile Home Water Heaters	40
	Pool/Spa Heaters	Exempt
	All Other	14
400,001 to 2,000,000	Mobile Home Water Heaters	40
	Pool/Spa Heaters	14 (20)
	All Other	14 (20)

Summary of Achieved in Practice Control Technologies

The following control technologies have been identified and are ranked based on stringency:

UNIT CONVERSION FOR NOx & CO

Depending on the agency, NOx and CO emission standards were listed in either ppmvd @ 3% O_2 or in nanograms per joule of heat output. For purposes of comparison all nanograms per joule of heat output standards have been converted to ppmvd @ 3% O_2.

NOx AND CO ACHIVED IN PRACTICE STANDARDS

For boilers in the size range covered by this determination, burner design is the predominant method to control NOx emissions. Low-NOx burners typically lower the flame temperature and require greater excess air levels which can cause increases in CO emissions. Therefore, because these pollutants can be dependent on one another, standards will be ranked together. Due to the non-attainment status in Sacramento County, an emphasis will be placed on NOx emissions when ranking emission standards. Previously, the industry standard for units in this range was to obtain SCAQMD certification for compliance with their Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters. As shown below, the NOx and CO standards in the SBCAPCD BACT Guidelines are more stringent than SCAQMD certification.

SBCAPCD BACT Guidelines 2.1 and 2.2 apply to units fueled by liquid and/or gaseous and/or solid fossil fuels. SBCAPCD Rule 802 requires BACT to be applied to new sources that emit 25 lbs/day or more of any nonattainment pollutant or its precursors (except CO). The rule also has an exemption for sources from offset requirements as long as applicants meet the specified conditions, one of which is to apply BACT to the equipment or process. This rule also sets an offset threshold of 25 tons/year for nonattainment pollutants and precursors (except CO and PM2.5). As of yet, for the size range covered by this determination, the SBCAPCD guidelines have only been applied to units at a single source in order for the source to be exempt from offset requirements. Specifically, the 12 ppmvd NOx standard BACT was applied to three 1.5 MMBtu/hr natural gas-fired boilers in a stacked configuration (manifolded together).

In contrast, the SMAQMD requires BACT to be applied to all new sources that emit over 0 lbs/day (or 0.49 lbs/day due to rounding) of NOx. The SMAQMD permits all units with a maximum heat input of 1.0 MMBtu/hr or greater or multiple units used in the same process whose combined maximum heat input rating is 1.0 MMBtu/hr or greater. Whereas, the SBCAPCD exempts external combustion equipment with a maximum heat input rating less than or equal to 2.0 MMBTU/hr. Because of the low permitting and BACT thresholds, if adopted, the 12 ppmvd NOx limit would be applied to many more boilers including small sources where the only permitted unit may be a space heating boiler between 1.0 and 2.0 MMBtu/hr. Because of this discrepancy staff reviewed current new products being offered by major boiler manufactures for natural gas-fired units in this range. Staff found that several manufacturers have natural gas-fired units that span the size range between 1.0 and 2.0 MMBtu/hr that are guaranteed to meet a NOx standard of 12 ppmvd at 3% O_2. Based on this review, the SMAQMD considers units meeting the 12 ppmvd NOx limit in this size range to be readily available and this standard to be achieved in practice.

Even though many of the units that guarantee the 12 ppmvd standard for NOx can be fueled by either natural gas or LPG, the guaranteed NOx standard only applies to the unit when it is fueled by natural gas. Staff has been unable to find any units in this size range fueled by LPG that is guaranteed to meet anything beyond the 30 ppmvd at 3% O_2 standard that was required by the previous BACT determination #219. The BACT Guidelines from SBCAPCD apply to LPG fired unit as well. When asked if the standard had been applied to any LPG-fired units, SBCAPCD responded saying that it had not. They also stated that if an applicant was proposing an LPG-fired unit that was required to meet BACT, they would require the applicant to propose a natural gas-fired unit instead. The SMAQMD currently has active permits with businesses that operate propane/LPG-fired boilers in areas of Sacramento County that are not served by pipeline natural gas. Therefore, the SMAQMD does not consider the SBCAPCD BACT Guidelines 2.1 and 2.2 to be achieved in practice for Propane/LPG-fired units and because natural gas is not available to areas of Sacramento County it is not feasible to require all units to use natural gas as a fuel.

NOx AND CO FOR NATURAL GAS-FIRED UNITS RATED ≥ 75,000 and < 400,000 BTU/HR

Achieved in Practice Standards for NOx & CO for Natural Gas-Fired Units Rated ≥ 75,000 and < 400,000 BTU/hr

Rank	Unit Type	Standard/Control		Source
		NOx	CO	
1	All units	20	50	SBCAPCD BACT 2.1 (2017)
2	Pool/spa heaters	55	Good combustion practices	SMAQMD BACT 218 (2019)
	All other units	20	400	
3	Pool heaters	55	No standard	SCAQMD Rule 1146.2 (2018)
	All other units	20	No standard	
4	Units fueled on non-PUC gas	77	No standard	SJVAPCD Rule 4308 (2013) & SDCAPCD Rule 69.2.1 (2020)
	Pool Heaters Fueled on PUC Gas	55	No standard	
	All other units	20	No standard	
5	Mobile home water heaters	55	No standard	BAAQMD Reg. 9 Rule 6 (2007)
	Pool/spa heaters	Exempt	Exempt	
	All other units (A)	20	No standard	

(A) Units with a maximum heat input rating of exactly 75,000 Btu/hr have a lower NOx emission standard of 10 ng/J (15 ppmvd @3% O_2)

NOx AND CO FOR NATURAL GAS-FIRED UNITS RATED ≥ 0.4 and < 2.0 MMBTU/HR

Achieved in Practice Standards for NOx & CO for Natural Gas-Fired Units Rated ≥ 400,000 and < 2,000,000 BTU/hr				
Rank	Unit Type	Standard/Control		Source
		NOx	CO	
1	< 1.000 MMBtu/hr (A)	20	100	SBCAPCD BACT 2.2 (2017)
	≥ 1.000 MMBtu/hr	12	100	
2	All units	20	400	SMAQMD BACT 218 (2019) & SCAQMD Rule 1146.2 (2018)
3	All units fueled on non-PUC gas	30	400	SDCAPCD Rule 69.2.1 (2020)
	All units fueled on PUC gas	20	400	
4	Instantaneous water heaters fueled on non-PUC gas	77	400	SJVAPCD Rule 4308 (2013)
	All other units fueled on non-PUC gas	30	400	
	All units fueled on PUC gas	20	400	
5	Mobile home water heaters	55	No standard	BAAQMD Reg. 9 Rule 6 (2007)
	All other units	20	No standard	

(A) Units with a maximum heat input rating of exactly 400,000 Btu/hr fall under SBCAPCD BACT Guideline 2.1 and has a lower CO standard of 50 ppmvd at 3% O_2.

NOx AND CO LPG-FIRED UNITS RATED ≥ 75,000 and < 400,000 BTU/HR

Achieved in Practice Standards for NOx & CO for LPG-Fired Units Rated ≥ 75,000 and < 400,000 BTU/hr				
Rank	Unit Type	Standard/Control		Source
		NOx	CO	
1	Pool/spa heaters	77	Good combustion practices	SMAQMD BACT 218 (2019)
	All other units	30	400	
2	All units	77	No standard	SJVAPCD Rule 4308 (2013) & SDCAPCD Rule 69.2.1 (2020)
3	All units	No standard	No standard	SCAQMD & BAAQMD

NOx and CO FOR LPG-FIRED UNITS RATED ≥ 0.4 and < 2.0 MMBTU/HR

Achieved in Practice Standards for NOx & CO for LPG-Fired Units Rated ≥ 400,000 and < 2,000,000 BTU/hr				
Rank	Unit Type	Standard/Control		Source
		NOx	CO	
1	All units	30	400	SMAQMD BACT 218 (2019) & SDCAPCD Rule 69.2.1 (2020)
2	Instantaneous water heaters	77	400	SJVAPCD Rule 4308 (2013) & SDCAPCD Rule 69.2.1 (2020)
	All other units	30	400	
3	All units	No standard	No standard	SCAQMD & BAAQMD

VOC FOR NATURAL GAS AND LPG-FIRED UNITS

The only standard set for VOC for this category of equipment is the use of good combustion practices by last SMAQMD BACT Determination, CARB BACT Clearinghouse (SBCAPCD), and EPA BACT Clearinghouse.

SOx AND PM FOR NATURAL GAS-FIRED UNITS

The SBCAPCD BACT Guidelines list the same standard for SOx, PM10 and PM2.5, which relates to burning only low sulfur fuel. Sulfur content in fuels does contribute to particulate emissions through the formation of sulfates. A small portion of sulfates are directly emitted from combustion, but most are formed in the atmosphere as a biproduct of sulfur dioxide emissions. Therefore, a reduction in the sulfur content of the fuel would lead to a reduction in particulate matter and will be considered achieved in practice as a standard for particulate matter. Because the achieved in practice per agency for SOx, PM10, and PM2.5 for natural gas-fired units are equivalent they have been combined into one section for brevity.

Achieved in Practice Standards for SOx for Natural Gas-Fired Units Rated ≥ 75,000 and < 2,000,000 BTU/hr		
Rank	Standard/Control	Source
1	PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S) outlined in a Fuel Gas Sulfur Plan.	SBCAPCD BACT 2.1 & 2.2 (2017)
2	Good combustion practices	SMAQMD BACT 218 (2019)
3	No standards	SMAQMD, SJVAPCD, SDCAPCD, BAAQMD

(A) PUC Natural Gas stands for California Public Utility Commission Quality Natural Gas. California requires that PUC Gas contain no more than 0.25 grains of hydrogen sulfide and no more than 5 grains of total sulfur per 100 scf of gas.

SOx AND PM FOR LPG-FIRED UNITS

As stated previously the SBCAPCD BACT Guidelines 2.1 and 2.2 are not considered achieved in practice for LPG-fired units and will not be considered in this comparison. Because the achieved in practice per agency for SOx, PM10, and PM2.5 for natural gas-fired units are equivalent they have been combined into one section for brevity.

Achieved in Practice Standards for SOx, PM10, and PM2.5 for LPG-Fired Units Rated ≥ 75,000 and < 2,000,000 BTU/hr		
Rank	Standard/Control	Source
1	Good combustion practices	SMAQMD BACT 218 (2019)
2	No standards	SMAQMD, SJVAPCD, SDCAPCD, BAAQMD

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

The District's Small Emitter and "Otherwise-Exempt Equipment" BACT Determinations policy (dated 5/16/2019) states that units which are classified as small emitters (less than 10 lbs/day of VOC, NOx, SOx, PM10, or PM2.5 and less than 550 lbs/day of CO) and are located at non-major stationary sources are only required to meet BACT standards that have been achieved in practice. Therefore, this BACT determination will only be based on what is achieved in practice and will only be applied to small emitters at non-major sources. BACT will be evaluated on a case-by-case basis for units that do not fit these criteria.

C. SELECTION OF BACT:

Based on the above analysis, BACT for VOC, NOx, SOx, PM10, PM2.5 and CO will be the most stringent standards of what is currently achieved in practice.

BACT DETERMINATION #299 – BOILERS/HEATERS RATED GREATER THAN OR EQUAL TO 75,000 BTU/HR TO LESS THAN 2.0 MMBTU/HR, FIRED ON NATURAL GAS – SMALL EMITTER CATEGORY		
Pollutant	**Standard**	**Source**
VOC	Good combustion practices	SMAQMD, SBCAPCD
NOx	Units rated < 1.0 MMBtu/hr: 20 ppmvd at 3% O_2 Units rated ≥ 1.0 MMBtu/hr: 12 ppmvd at 3% O_2	SBCAPCD
SOx	PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S)	SBCAPCD
PM10	PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S) outlined in a Fuel Gas Sulfur Plan.	SBCAPCD

BACT DETERMINATION #299 – BOILERS/HEATERS RATED GREATER THAN OR EQUAL TO 75,000 BTU/HR TO LESS THAN 2.0 MMBTU/HR, FIRED ON NATURAL GAS – SMALL EMITTER CATEGORY		
PM2.5	PUC quality natural gas or produced gas treated using a continuously operating sulfur removal system (≤ 80 ppmv total sulfur & ≤ 4 ppmv H_2S) outlined in a Fuel Gas Sulfur Plan.	SBCAPCD
CO	Units rated < 0.4 MMBtu/hr: 50 ppmvd at 3% O_2 Units rated ≥ 0.4 MMBtu/hr: 100 ppmvd at 3% O_2	SMAQMD

BACT DETERMINATION #300 – BOILERS/HEATERS RATED GREATER THAN OR EQUAL TO 75,000 BTU/HR TO LESS THAN 2.0 MMBTU/HR, FIRED ON LPG – SMALL EMITTER CATEGORY		
Pollutant	**Standard**	**Source**
VOC	Good combustion practices	SMAQMD
NOx	Units rated < 0.4 MMBtu/hr: 77 ppmvd @ 3% O_2 Units rated ≥ 0.4 MMBtu/hr: 30 ppmvd @ 3% O_2	SMAQMD / SCAQMD
SOx	Good combustion practices	SMAQMD
PM10	Good combustion practices	SMAQMD
PM2.5	Good combustion practices	SMAQMD
CO	Units rated < 0.4 MMBTU/hr: Good combustion practices Units rated ≥ 0.4 MMBTU/hr: 400 ppmvd @ 3% O_2	SMAQMD

D. SELECTION OF T-BACT:

Toxics are in the form of VOCs and particulate matter. Since toxic emissions from natural gas and LPG-fired boilers in the 75,000 Btu/hr to less than 2.0 MMBtu/hr range are so small and the cancer risk is expected to be well below 1 in a million cases, T-BACT was not evaluated for this determination.

APPROVED BY: *Brian F Krebs* **DATE:** 2-3-2022

Attachment A

Review of BACT Determinations published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse (RBLC) for Commercial/Institutional-Sized Boilers/Furnaces < 100 Million BTU/H - Natural Gas (includes propane & liquefied petroleum gas) (Process Code 13.310):

Boilers/Heaters < 2.0 MMBTU/hr							
RBLC#	**Permit Date[(A)]**	**Rating**	**Fuel**	**Pollutant**	**Standard**	**Control Technology**	**Case-By-Case Basis**
MI-0426	3/24/2017	1 MMBTU/hr	Natural gas	NOx	9 ppmvd @ 3% O_2	Ultra-low NOx burner and good combustion practices	BACT-PSD
MI-0426	3/24/2017	1 MMBTU/hr	Natural gas	CO	84 lb/MMSCF	Good combustion practices and clean burn fuel (pipeline quality NG)	BACT-PSD
MI-0426	3/24/2017	1 MMBTU/hr	Natural gas	PM10/PM2.5	0.52 lb/MMSCF	Good combustion practices and clean burn fuel (pipeline quality NG)	BACT-PSD
SC-0179	3/18/2015	1.83 MMBTU/hr	Natural gas	PM10	0.01 lb/hr	Use of natural gas and good combustion practices	BACT-PSD
SC-0179	3/18/2015	1.83 MMBTU/hr	Natural gas	PM2.5	0.003 lb/hr	Use of natural gas and good combustion practices	BACT-PSD
SC-0179	3/18/2015	1.83 MMBTU/hr	Natural gas	VOC	0.01 lb/hr	Use of natural gas and good combustion practices	BACT-PSD

(A) Due to the large number of entries only determinations made (based on Permit Date) entered since 01/01/2009 are included in the above table.

= Selected as the most stringent BACT determination achieved in practice.

Attachment B

Public Comments

SIEMENS

Brian Krebs
Permitting Program Manager
Sacramento Metropolitan AQMD
777 12th Street, 3rd Floor
Sacramento, CA 95814

Dear Mr. Krebs,

On November 23, 2021, the Sacramento Metropolitan Air Quality Management District (District) issued draft Best Available Control Technology (BACT) Determination #299 (Natural Gas-Fired Boilers/Heaters Rated < 2.0 MMBtu/hr) for public comment.

The draft BACT Determination would establish BACT for nitrogen oxides (NOx) as:

- 12 parts per million corrected to 3% oxygen, or O_2 (ppmc) as "achieved-in-practice" for boilers rated at least 1.0 MMBtu/hr but less than 2.0 MMBtu/hr; and

- 20 ppmc as "achieved-in-practice" for boilers rated at least 0.075 MMBtu/hr but less than 1.0 MMBtu/hr and

Siemens Mobility, Inc. (Siemens) owns and operates the French Road Railcar Manufacturing Plant in the Florin area of unincorporated Sacramento County. Siemens currently operates eight natural gas-fired make-up air units (MAUs) rated < 2.0 MMBtu/hr. Siemens is planning to replace these MAUs. The District has indicated that BACT Determination #299 will apply to MAUs (as would BACT Determination #239 [Natural Gas-Fired Boilers/Heaters Rated at least 2.0 MMBtu/hr but less than 5.0 MMBtu/hr]. As such, this draft BACT Determination is directly relevant to Siemens' MAU Project as it will affect the design of Siemens new equipment (or modification of existing equipment).

The Public Notice states that the deadline for sbumitting comments to the District is December 27, 2021. Siemens has reviewed the draft BACT Determination and is submitting the following the comments:

- BACT Determination #299 applies to any natural gas-fired external combustion equipment used to produce hot water or steam. As such, BACT Determination does not directly apply to make-up air units (MAUs) since these devices heat ventilation air instead of water or steam.

- It appears that the District either will have to broaden BACT Determination #299 to apply to air heating external combustion devices or develop a separate BACT determination for this equipment.

- MAUs comprise indirect-heated or direct-heated designs.
    - Indirect designs use an internal furnace section to transfer heat from hot combustion gases to the ventilation air. Combustion gases discharge separately (and directly) to the atmosphere while the heated ventilation air discharges through the building ventilation system.
    - Direct-heated designs do not contain an internal furnace section but, rather, inject (and ignite) the natural gas directly into the ventilation air steam. Combustion gases mix with the ventilation air and discharge to the atmosphere through the building ventilation system.

SIEMENS

- The indirect-heater design reflects a preferred engineering design because it discharges combustion gases directly to the atmosphere and does not expose workers to the combustion gases, regardless of the amount of dilution. As a point of reference, residential heating systems use furnace that provide indirect heating to prevent potentially dangerous accumulation of carbon dioxide (CO_2) concentrations in the living space.

- Siemens understands that indirect-heated MAUs comprise the majority of the MAU options in the marketplace. No manufacturer of small, indirect-heated MAUs (i.e., < 2.0 MMBtu/hr) offers an MAU that is equipped with an ultra low-NOx burner that can meet the proposed boiler NOx standard that the District has deemed "achieved-in-practice" for steam/water heating external combustion. As such, Siemens asserts that the District's proposed boiler BACT standard in BACT Determination #299 is not "achieved-in-practice" for indirect-heated MAUs.

- Siemens understands that natural gas-fired gun burners can meet the various boiler NOx BACT standards proposed in BACT Determination #299. Siemens further understands that some MAU manufacturers package an MAU with a gun burner.

- Since there is a compelling reason to select an indirect-heated MAU in lieu of a direct-heated MAU, any BACT determination for air heating external combustion should address indirect-heated and direct-heater MAUs separately.

Please contact me at (650) 444-4376 if you have any questions or need any additional information.

With kind regards,

Jesse Fantone
Manager, Environmental, Health & Safety
Siemens Mobility, Inc.