



**MAR 22 2016**

N. Ross Buckenham  
ABEC #3 LLC dba Lakeview Dairy Biogas  
c/o California Bioenergy, LLC  
2828 Routh St, Suite 500  
Dallas, TX 75201-1438

**Re: Notice of Preliminary Decision - Authority to Construct**  
**Facility Number: S-8637**  
**Project Number: S-1143770**

Dear Mr. Buckenham:

Enclosed for your review and comment is the District's analysis of ABEC #3 LLC dba Lakeview Dairy Biogas's application for an Authority to Construct for installation of an anaerobic digester system and two 1,468 bhp digester gas-fired IC engines with selective catalytic reduction (SCR) systems for emissions control at Lakeview Farms dairy, at 17702 Bear Mountain Blvd, Bakersfield, CA.

The notice of preliminary decision for this project will be published approximately three days from the date of this letter. After addressing all comments made during the 30-day public notice period, the District intends to issue the Authority to Construct. Please submit your written comments on this project within the 30-day public comment period, as specified in the enclosed public notice.

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Mr. Ramon Norman of Permit Services at (559) 230-5909.

Sincerely,



Arnaud Marjollet  
Director of Permit Services

AM:rn

Enclosures

cc: Tung Le, CARB (w/ enclosure) via email

**Seyed Sadredin**  
Executive Director/Air Pollution Control Officer

**Northern Region**  
4800 Enterprise Way  
Modesto, CA 95356-8718  
Tel: (209) 557-6400 FAX: (209) 557-6475

**Central Region (Main Office)**  
1990 E. Gettysburg Avenue  
Fresno, CA 93726-0244  
Tel: (559) 230-6000 FAX: (559) 230-6061

**Southern Region**  
34946 Flyover Court  
Bakersfield, CA 93308-9725  
Tel: 661-392-5500 FAX: 661-392-5585



directly to the dairy. Because the dairy and the proposed digester gas power plant at the site will be separately owned and operated and will have different two-digit Standard Industrial Classification (SIC) codes (Industry Group 24: Dairy Farms for the dairy vs. Industry Group 49: Electric, Gas, And Sanitary Services for the IC engine generator sets), pursuant to Section 3.39 of District Rule 2201, the proposed digester system and the digester gas-fired IC engines will not be part of the dairy agricultural stationary source. Therefore, the digester system and digester gas-fired IC engines will be permitted as a separate non-agricultural stationary source (Facility S-8637).

## II. Applicable Rules

Rule 2201 New and Modified Stationary Source Review Rule (4/21/11)  
Rule 2410 Prevention of Significant Deterioration (6/16/11)  
Rule 2520 Federally Mandated Operating Permits (6/21/01)  
Rule 4101 Visible Emissions (2/17/05)  
Rule 4102 Nuisance (12/17/92)  
Rule 4201 Particulate Matter Concentration (12/17/92)  
Rule 4701 Stationary Internal Combustion Engines – Phase 1 (8/21/03)  
Rule 4702 Stationary Internal Combustion Engines (11/14/13)  
Rule 4801 Sulfur Compounds (12/17/92)  
40 CFR Part 60, Subpart JJJJ Standards of Performance for Stationary Spark Ignition Internal Combustion Engines  
40 CFR Part 63, Subpart ZZZZ National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines  
CH&SC 41700 Health Risk Assessment  
CH&SC 42301.6 School Notice  
Public Resources Code 21000-21177: California Environmental Quality Act (CEQA)  
California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387: CEQA Guidelines

## III. Project Location

The ABEC #3 LLC Stationary Source (Facility S-8637) is located on Lakeview Farms dairy at 17702 Bear Mountain Blvd, Bakersfield, CA (Mt. Diablo Meridian T 31S, R 26E, Sec 20 in Kern County). The proposed equipment is not located within 1,000 feet of the outer boundary of a K-12 school. Therefore, the public notification requirement of California Health and Safety Code 42301.6 is not applicable to this project.

## IV. Process Description

### Anaerobic Digester System

An anaerobic digester is a sealed basin or tank that is designed to accelerate and control the decomposition of organic matter by microorganisms in the absence of oxygen. Anaerobic decomposition results in the conversion of organic compounds in the substrate into methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), and water rather than intermediate Volatile Organic Compounds (VOCs). The gas generated by this process is known as biogas, waste gas, or digester gas. In addition to methane and carbon dioxide, biogas may also contain small amounts of Nitrogen (N<sub>2</sub>), Oxygen (O<sub>2</sub>), Hydrogen Sulfide (H<sub>2</sub>S), and Ammonia (NH<sub>3</sub>). Biogas may also include

trace amounts of various VOCs that remain from incomplete digestion of the volatile solids in the incoming substrate. Because biogas is mostly composed of methane, the main component of natural gas, the gas produced in the digester can be cleaned to remove H<sub>2</sub>S and other impurities and used as fuel.

The proposed anaerobic digester system will be designed to process the manure generated by the cattle at Lakeview Farms dairy. The manure will be flushed from the cow housing areas at the dairy to a mechanical separation system prior to the digester system. This pre-digester mechanical separation system will remove fibrous solids from the manure. After the mechanical separation system, the liquid manure will flow to a sand settling lane that is designed to remove heavy solids by sedimentation. After the separation systems, the liquid manure will gravity flow into the proposed covered lagoon digesters. The liquid effluent from the covered lagoon digesters will be pumped to the existing large storage pond at the dairy from where it can be used to irrigate and fertilize adjacent cropland.

The proposed anaerobic digester system will process the liquid fraction from the dairy manure solid separation system. The anaerobic digester system will consist of an in-ground, covered lagoon anaerobic digester that will be divided into one or more cells. The final number of covered lagoon anaerobic digester cells and the final dimensions of each cell will be determined based on borings to locate subsurface sand and groundwater that are required to demonstrate compliance with the requirements of the Regional Water Quality Control Board. The preliminary information submitted by the applicant indicates that the first cell of the covered lagoon anaerobic digester will have the following approximate dimensions: 655 ft long by 262 ft wide at the top, with an average depth of 23 ft, and a side slope (run/rise) of 2.0 and that the second cell of the covered lagoon anaerobic digester will have the following approximate dimensions: 500 ft long by 200 ft wide at the top, with an average depth of 22.75 ft, and a side slope (run/rise) of 2.0. The covered lagoon digester will operate at ambient temperatures; however, the covered lagoon digester may utilize heat from the engines to warm the substrate to promote more efficient anaerobic digestion. An area located east of the existing lagoons at the dairy, which is currently used for drying and storage of solid manure, will be excavated to create the proposed covered lagoon anaerobic digester.

The applicant indicates that the lagoon cell(s) will be covered in accordance with Natural Resources Conservation Services (NRCS) Practice Standard Code 367 – Roofs and Covers. The bottom and the walls of the new lagoon cell(s) will be lined with high-density polyethylene (HDPE) membranes and a gas collection system will be installed. The new lagoon cells will be fitted with HDPE covers. The gas collection system will consist of perforated piping under the HDPE covers of the covered lagoons.

The covered lagoon digester will be equipped with an air injection system for removal of H<sub>2</sub>S from the digester gas. The continuous injection of controlled quantities of air under the digester covers increases the amount of oxygen in the space under the digester covers and in the surface layer of the digester liquid, which facilitates oxidation of sulfides in the digester gas and at the surface of the liquid to elemental sulfur and water. Injection of air also promotes biological removal of H<sub>2</sub>S from the digester gas by facilitating the establishment of sulfur oxidizing microorganisms, such as Thiobacillus species, which have the ability to grow under various environmental conditions and oxidize H<sub>2</sub>S to elemental sulfur. The digester gas will be captured by the covered lagoon gas collection system and will be piped to the gas conditioning

system for polishing to remove additional H<sub>2</sub>S and for removal of moisture. The gas will then be sent to the engines for use as fuel to generate electricity for sale to a utility and to produce heat for the digester system. When the gas cannot be used in the engines, the digester gas will collect under the lagoon covers. As the gas collects under the lagoon covers, the pressure in the digesters will rise. In rare emergency situations when the gas cannot be combusted in the engines for an extended period, the pressure will cause the relief valves to open and release the digester gas, composed primarily of methane and carbon dioxide, into the atmosphere. As the pressure decreases, the gas relief valves will automatically close and normal operation will proceed.

When operating at full capacity, the digester system is expected to produce an average of 360,000 ft<sup>3</sup> of biogas per day. The applicant has indicated that the biogas produced by the covered lagoon digester will be composed of approximately 60-70% methane and 30-40% carbon dioxide. Because the proposed digester system will be able to store the biogas for extended periods under the digester covers and the proposed engines at the ABEC #3 LLC Stationary Source (Facility S-8637) will have more than sufficient capacity to combust all of the gas generated, no flare is being proposed for the digester installation at this facility.

#### Covered Lagoon Anaerobic Digester Measurements

The measurements given below for the proposed covered lagoon anaerobic digester cells at the ABEC #3 LLC Stationary Source (Facility S-8637) are based on the preliminary information provided by the applicant. As discussed above, the final number of covered lagoon anaerobic digester cells and the final dimensions of each cell will be determined based compliance with the requirements of the Regional Water Quality Control Board.

- 1st Covered Lagoon Anaerobic Digester Cell
  - Top Dimensions: 655 ft long x 262 ft wide
  - Average Depth: 23 ft
  - Side Slope (run/rise): 2.0
  - Approximate Volume (not including 2 ft. freeboard): 2,705,808 ft<sup>3</sup> (~20,239,444 gal)
- 2nd Covered Lagoon Anaerobic Digester Cell
  - Top Dimensions: 500 ft long x 200 ft wide
  - Average Depth: 22.75 ft
  - Side Slope (run/rise): 2.0
  - Approximate Volume (not including 2 ft. freeboard): 1,613,210 ft<sup>3</sup> (~10,612,380 gal)

#### Digester Gas-Fired IC Engines

The applicant is proposing to install two 1,468 bhp GE Jenbacher model J 320 GS-C82 lean burn digester gas-fired IC engines (or equivalent engines of equal or lesser rating approved by the District, such as 1,412 bhp Caterpillar model A3516A+ IC engines or 1,431 bhp Dresser Rand Guascor model SFGLD 560 IC engines). Each engine will be equipped with an SCR system and will power an electrical generator that will produce up to 1,059 kW<sub>e</sub>. Digester gas, which consists mostly of methane, the main component of natural gas, will be combusted in the IC engines to produce power. After initial removal of H<sub>2</sub>S in the digester system, the digester gas will be piped to the gas conditioning system for polishing to remove H<sub>2</sub>S using an iron sponge and/or activated carbon H<sub>2</sub>S scrubber or an equivalent H<sub>2</sub>S removal system and for removal of moisture. The digester gas will then be piped to the IC engines for use as fuel. The engines will power electrical generators that will produce power to be sold to a utility. Excess heat from the engines will be used in the first covered lagoon anaerobic digester (West

Lagoon Digester) to promote more efficient production of digester gas. The engines will be permitted to operate up to 24 hr/day and 8,760 hr/year.

In addition to the use of digester gas as fuel, the engines will also be permitted to use natural gas as fuel for no more than 96,000 kW-hrs of operation during initial utility interconnect testing in the event that insufficient digester gas is available for the engines at the time that the required utility testing is scheduled. The engines will remain subject to the same emission limits during the limited period that allows the use of natural gas fuel for required utility testing.

## **V. Equipment Listing**

S-8637-1-0: ANAEROBIC DIGESTER SYSTEM CONSISTING OF COVERED LAGOON ANAEROBIC DIGESTER CELL(S) WITH PRESSURE/VACUUM VALVE(S) AND AN AIR INJECTION SYSTEM FOR CONTROL OF H<sub>2</sub>S

S-8637-2-0: 1,468 BHP GE JENBACHER MODEL J 320 GS-C82 (OR DISTRICT APPROVED EQUIVALENT) DIGESTER GAS-FIRED LEAN-BURN IC ENGINE WITH A SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, AND AN IRON SPONGE AND/OR CARBON H<sub>2</sub>S REMOVAL SYSTEM (OR APPROVED EQUIVALENT H<sub>2</sub>S REMOVAL SYSTEM) POWERING AN ELECTRICAL GENERATOR

S-8637-3-0: 1,468 BHP GE JENBACHER MODEL J 320 GS-C82 (OR DISTRICT APPROVED EQUIVALENT) DIGESTER GAS-FIRED LEAN-BURN IC ENGINE WITH A SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, AND AN IRON SPONGE AND/OR CARBON H<sub>2</sub>S REMOVAL SYSTEM (OR APPROVED EQUIVALENT H<sub>2</sub>S REMOVAL SYSTEM) POWERING AN ELECTRICAL GENERATOR

## **VI. Emission Control Technology Evaluation**

### Digester System (S-8637-1-0)

The digester system will be equipped with a pressure-vacuum (PV) relief valves or an emergency venting system. The digester gas will be scrubbed to remove hydrogen sulfide (H<sub>2</sub>S) and will be used to fuel engines to generate electricity. Combustion of the digester gas in the engines will convert any VOCs present in the gas into carbon dioxide and water. As stated above, because the digester system will be able to store the gas for extended periods and the engines will have more than enough capacity to combust all of the gas generated, no flare is being proposed for this digester project.

### H<sub>2</sub>S Removal

As described above, the covered lagoon anaerobic digester will utilize an air injection system for removal of H<sub>2</sub>S from the digester gas. The continuous injection of controlled quantities of air under the lagoon covers increases the amount of oxygen in the space under the digester covers and the surface layer of the liquid in the covered lagoon digester, which facilitates oxidation of sulfides in the digester gas and in the liquid surface to elemental sulfur and water.

The sulfur dissolves in the liquid in the digester and can be removed from the digester system by deposition and filtration. Injection of air also promotes biological removal of H<sub>2</sub>S from the digester gas by facilitating the establishment of sulfur oxidizing microorganisms, such as Thiobacillus species, which have the ability to grow under various environmental conditions and oxidize H<sub>2</sub>S to elemental sulfur and sulfates that can be removed from the digester system. Use of air injection to remove H<sub>2</sub>S from digester gas has been shown to have higher effectiveness in covered lagoon digesters because the large areas under the lagoon covers facilitate contact with the digester gas and lagoon surface, which enables improved oxidation and biological reduction of sulfides. Successful installations of the air injection sulfur removal system have demonstrated significantly reduced operation costs when compared to other methods of sulfur removal.

For final polishing, the digester gas will be sent through an iron sponge H<sub>2</sub>S scrubber and/or an activated carbon H<sub>2</sub>S scrubber or an equivalent system to remove H<sub>2</sub>S from the gas prior to combustion in the proposed engines.

An iron sponge scrubber is comprised of vessel(s) containing iron sponge, which consists of a hydrated form of iron oxide infused onto wood shavings. The wood shavings serve only as a carrier for the iron oxide powder. Iron oxide infused into the wood surface will not wash off or migrate with the gas. As the gas passes through the iron sponge material, the H<sub>2</sub>S is removed by the following chemical reaction producing black iron sulfide and water:



For the iron sponge to perform effectively, it must be maintained within a defined range of sufficient moisture content. This requirement is typically satisfied if the gas is saturated with water vapor, as is frequently the case with digester gas. If the iron sponge becomes dry, it can be re-wet and remain effective. The iron sponge reaction is not pressure sensitive.

Specially treated activated carbon can also be used to remove H<sub>2</sub>S from gas streams. H<sub>2</sub>S will be adsorbed as the gas flows through the activated carbon bed. Activated carbon has a large number of pores, which greatly increase the surface area for adsorption. Contaminants in the gas diffuse into these pores and are retained on the carbon surface due to both chemical and physical forces. Activated carbon used for the removal of H<sub>2</sub>S is usually treated with chemical bases to increase the holding capacity for H<sub>2</sub>S.

The proposed scrubber will consist of enclosed vessels filled with iron sponge and/or treated activated carbon. The digester gas will flow through the scrubber and then to a dryer and chiller to remove moisture. For continuous operation, there will be a secondary unit that will be brought online at specified times or when monitoring indicates that the primary unit is nearing saturation. Valves can be arranged so either bed can operate while the other is serviced. The useful life of the iron sponge and activated carbon vessels will vary depending on the inlet concentration of H<sub>2</sub>S, the flow rate, and the mass in the vessels. Before a scrubber is completely spent, it must be regenerated or replaced. Spent iron sponge or activated carbon vessels will be sent to a regeneration facility or to an appropriate disposal facility.

The proposed scrubber will be capable of reducing H<sub>2</sub>S concentrations in the digester gas to 40 ppmv or less. Reducing the H<sub>2</sub>S concentration in the gas will minimize SO<sub>x</sub> emissions from

combustion and will also reduce the maintenance requirements for the engines and will protect catalysts from masking, plugging, and poisoning.

### Digester Gas-Fired IC Engines (S-8637-2-0 & -3-0)

The proposed engines will be equipped with:

- Turbocharger
- Aftercooler
- Air/Fuel Ratio or an O<sub>2</sub> Controller
- Lean Burn Technology
- Positive Crankcase Ventilation (PCV) or 90% efficient control device
- Selective Catalytic Reduction (SCR)

The turbocharger reduces NO<sub>x</sub> emissions from engines by increasing the efficiency and promoting more complete burning of the fuel.

The aftercooler functions in conjunction with the turbocharger to reduce the inlet air temperature. By reducing the inlet air temperature, the peak combustion temperature is lowered, which reduces the formation of thermal NO<sub>x</sub>.

The fuel/air ratio controller (oxygen controller) is used to maintain the amount of oxygen in the exhaust stream to optimize engine operation and catalyst function.

Lean burn technology increases the volume of air in the combustion process and therefore increases the heat capacity of the mixture. This technology also incorporates improved swirl patterns to promote thorough air/fuel mixing. This in turn lowers the combustion temperature and reduces NO<sub>x</sub> formation.

The PCV system or 90% efficient control device reduces crankcase VOC and PM<sub>10</sub> emissions by at least 90% over an uncontrolled crankcase vent.

A Selective Catalytic Reduction (SCR) system operates as an external control device where flue gases and a reagent, in this case urea, pass through an appropriate catalyst. Urea, will be injected upstream of the catalyst where it is converted to ammonia. The ammonia is used to reduce NO<sub>x</sub>, over the catalyst bed, to form elemental nitrogen, water vapor, and other by-products. The use of a catalyst typically reduces the NO<sub>x</sub> emissions by up to 90%.

## **VII. General Calculations**

### **A. Assumptions**

- ABEC #3 LLC dba Lakeview Dairy Biogas (Facility S-8637) and Lakeview Farms dairy (Facility S-5254) are separate stationary sources at the same site.
- Because of the high moisture content of separated manure solids, PM emissions from the handling of separated solids for the digester system are considered negligible.
- Because the manure for the digester system will be taken from the mechanical separation system at Lakeview Farms dairy and the digested solids and effluent from the digester system will be returned to Lakeview Farms dairy for use, all emissions from the manure



processed in the digester system will be allocated to the liquid manure handling system at Lakeview Farms dairy.

- The proposed digester system will reduce potential VOC emissions from manure generated by the cattle at Lakeview Farms dairy. Manure that is currently stored in uncovered lagoon(s) and pond(s) will instead be placed in covered ponds at the ABEC #3 LLC facility, thereby decreasing volatilization of compounds from the manure. In a digester, most VOCs present will be converted to methane (an exempt compound) and carbon dioxide further reducing the potential for VOC emissions. Because results of dairy digester analyses have indicated very low VOC content (less than 1% by weight), fugitive VOC emissions from the digester system are assumed to be negligible, consistent with District Policy SSP 2015. During operation, the digester gas will be directed to the engines where the gas will be combusted resulting in the oxidation of gaseous hydrocarbons into carbon dioxide and water. Therefore, VOC emissions from the digester system are considered negligible.
- Molar composition of typical digester gas is about 60% methane and 40% carbon dioxide with trace amounts of hydrogen sulfide, VOC, and other compounds.<sup>1</sup>
- Typical Higher Heating Value for Digester Gas: 600 Btu/scf (Per AP-42 (4/00) - notes to Tables Table 3.1-1, Table 3.1-2b, Table 3.1-7, and Table 3.1-8)
- Typical EPA F-factor for Digester Gas: 9,100 dscf/MMBtu (dry, adjusted to 60 °F), (Estimated based on previous digester gas fuel analyses for source tests)
- Average sulfur content of the scrubbed digester gas: 40 ppmv as H<sub>2</sub>S (required as BACT; approximately 2.4 grains/100 scf)
- bhp to Btu/hr conversion: 2,545 Btu/hp-hr
- Thermal efficiency of engines: commonly ≈ 33%
- Molar Specific Volume = 379.5 scf/lb-mol (at 60°F)
- Molecular weights:  
NO<sub>x</sub> (as NO<sub>2</sub>) = 46 lb/lb-mol      CO = 28 lb/lb-mol      NH<sub>3</sub> = 17 lb/lb-mol  
VOC (as CH<sub>4</sub>) = 16 lb/lb-mol      SO<sub>x</sub> (as SO<sub>2</sub>) = 64.06 lb/lb-mol
- Each of the engines will be permitted to operate 24 hours/day and 365 days per year.
- There will be no increase in permitted emissions for the limited use of natural gas for required initial utility testing in the event that sufficient digester gas is not available for the engines at the time that the required initial utility testing is scheduled.
- PM<sub>2.5</sub> emissions from the digester gas-fired IC engines are assumed to be equal to PM<sub>10</sub> emissions.

<sup>1</sup> U.S. EPA AgSTAR (<http://www2.epa.gov/agstar>), "Market Opportunities for Biogas Recovery Systems at U.S. Livestock Facilities" (November 2011, <http://www2.epa.gov/agstar/agstar-market-opportunities-report>); American Biogas Council – Frequent Questions ([https://www.americanbiogascouncil.org/biogas\\_questions.asp](https://www.americanbiogascouncil.org/biogas_questions.asp)); "Anaerobic Digestion Overview", David Schmidt, University of Minnesota Department of Biosystems and Agricultural Engineering (<http://www.extension.umn.edu/agriculture/manure-management-and-air-quality/manure-treatment/docs/anaerobic-digestion-overview.pdf>); and "Anaerobic Digestion of Animal Wastes: Factors to Consider", ATTRA - National Sustainable Agriculture Information Service (<https://attra.ncat.org/attra-pub/summaries/summary.php?pub=307>)

### Assumptions for Commissioning Period

- The applicant has requested that the ATC permits include a commissioning period to allow testing, adjustment, tuning, and calibration of the engines without the SCR systems installed. The duration of the commissioning period shall consist of no more than 120 hours of operation of each engine without an SCR system installed.
- Engine emissions during the commissioning period will be calculated as uncontrolled based on information provided by the engine supplier.

### **B. Emission Factors**

#### Emission Factors during the Commissioning Period:

The commissioning period precedes normal operation of a power plant. Activities conducted during the commissioning period typically include: checking all mechanical, electrical, and control systems for the units and related equipment; confirming the performance measures specified for the equipment; test firing the units; and tuning of the units and the generators. The early stages of commissioning are conducted prior to the installation of the emission control equipment to prevent damage to this equipment. In accordance with EPA's guidance, the commissioning period is considered the final phase of the construction process rather than initial startup of the equipment.<sup>2</sup> Therefore, other than quantifying emissions for New and Modified Source Review (NSR), source-specific emission limitations from applicable rules and regulations are generally not effective until completion of the commissioning period. Because emission control devices are not in place and functioning during commissioning, higher emission limits are required during this time.

The emission factors for NO<sub>x</sub> (1.0 g/bhp-hr), CO (4.85 g/bhp-hr), and VOC (1.0 g/bhp-hr) for the commissioning period are the emission factors provided by the engine supplier for the engines without SCR systems or oxidation catalysts. The emission factors during the commissioning period for SO<sub>x</sub> (0.04 g/bhp-hr), PM<sub>10</sub> (0.07 g/bhp-hr), and ammonia slip (0.05 g/bhp-hr) after initial installation of the SCR system are assumed to be the same emissions factors as during normal operation. SO<sub>x</sub> emissions are based on the maximum sulfur content of the dairy digester gas (required as BACT; approximately 2.4 grains/100 scf). PM<sub>10</sub> emissions on a lb/MMBtu basis are assumed to be similar to natural gas-fueled IC engines. For more conservative PM<sub>10</sub> emission calculations, the PM emission factor for rich burn natural gas-fueled engines given in EPA's Compilation of Air Pollutant Emission Factors (AP-42) is used because it is higher than the value for lean burn natural gas-fueled engines listed in EPA AP-42. The ammonia emission factor is based on the ammonia slip limit of 10 ppmv NH<sub>3</sub>.

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<sup>2</sup> See US EPA Implementation Question and Answer Document for National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines and New Source Performance Standards for Stationary Compression Ignition and Spark Ignition Internal Combustion Engines, April 2, 2013, Question 39 (<http://www.epa.gov/airtoxics/icengines/docs/20120717riceqaupdate.pdf>)

Commissioning Period Emission Factors for Digester Gas-Fired Engines		
Pollutant	g/bhp-hr	Source
NO <sub>x</sub>	1.0	Engine Supplier's Information
SO <sub>x</sub>	0.04	40 ppmvd in fuel gas; BACT Requirement/Mass Balance equation below
PM <sub>10</sub>	0.07	AP-42 (7/00) Table 3.2-3 (Conservative Value based on Rich-Burn Natural Gas Engines)
CO	4.85	Engine Supplier's Information
VOC	1.0	Engine Supplier's Information
NH <sub>3</sub>	0.05	10 ppmvd @ 15% O <sub>2</sub> in exhaust; Required/Proposed – See equation below

SO<sub>x</sub> – 40 ppmvd H<sub>2</sub>S in fuel gas

$$\frac{40 \text{ ft}^3 \text{ H}_2\text{S}}{10^6 \text{ ft}^3} \times \frac{32.06 \text{ lb S}}{\text{lb - mol H}_2\text{S}} \times \frac{\text{lb - mole}}{379.5 \text{ ft}^3} \times \frac{64.06 \text{ lb SO}_2}{32.06 \text{ lb S}} \times \frac{\text{ft}^3}{600 \text{ Btu}} \times \frac{10^6 \text{ Btu}}{\text{MMBtu}} = 0.0113 \frac{\text{lb SO}_x}{\text{MMBtu}}$$

$$0.0113 \frac{\text{lb SO}_x}{\text{MMBtu}} \times \frac{1 \text{ MMBtu}}{10^6 \text{ Btu}} \times \frac{\text{Btu}_{in}}{0.33 \text{ Btu}_{out}} \times \frac{2,545 \text{ Btu}}{\text{hp - hr}} \times \frac{453.59 \text{ g}}{\text{lb}} = 0.040 \frac{\text{g SO}_x}{\text{bhp - hr}}$$

NH<sub>3</sub> – 10 ppmvd @ 15% O<sub>2</sub> in exhaust

$$\frac{10 \text{ ppmv NH}_3}{10^6} \times \frac{17 \text{ lb NH}_3}{\text{lb - mole}} \times \frac{\text{lb - mole}}{379.5 \text{ ft}^3} \times \frac{9,100 \text{ ft}^3}{\text{MMBtu}} \times \frac{20.9\% \text{ O}_2}{(20.9 - 15)\% \text{ O}_2} = 0.0144 \frac{\text{lb NH}_3}{\text{MMBtu}}$$

$$0.0144 \frac{\text{lb NH}_3}{\text{MMBtu}} \times \frac{1 \text{ MMBtu}}{10^6 \text{ Btu}} \times \frac{\text{Btu}_{in}}{0.33 \text{ Btu}_{out}} \times \frac{2,545 \text{ Btu}}{\text{hp - hr}} \times \frac{453.59 \text{ g}}{\text{lb}} = 0.05 \frac{\text{g NH}_3}{\text{bhp - hr}}$$

Emission Factors during Normal Operation after the Commissioning Period:

The emission factors for NO<sub>x</sub> (0.15 g/bhp-hr), CO (1.75 g/bhp-hr), and VOC (0.10 g/bhp-hr) for the proposed engines during normal operation were proposed by the applicant and are supported by information provided by the engine supplier. The emission factors for NO<sub>x</sub> and VOC were required as BACT. The emission factors for SO<sub>x</sub> (0.04 g/bhp-hr), PM<sub>10</sub> (0.07 g/bhp-hr), and ammonia slip (0.05 g/bhp-hr) during normal operation are same as the emission factors presented above for the commissioning period.

Emission Factors for Digester Gas-Fired Engines (Normal Operation)				
Pollutant	g/bhp-hr	lb/MMBtu	ppmvd (@ 15%O <sub>2</sub> )	Source
NO <sub>x</sub>	0.15	0.0429	11 ppmvd	BACT Requirement; Proposed by Applicant – See equation on Page 11 below
SO <sub>x</sub>	0.04	0.0113	40 ppmvd in fuel gas	BACT Requirement/Mass Balance equation above
PM <sub>10</sub>	0.07	0.01941	--	AP-42 (7/00) Table 3.2-3 (Conservative Value based on Rich-Burn Natural Gas Engines)
CO	1.75	0.500	210 ppmvd	Proposed by Applicant – See equation on Page 11 below
VOC	0.10	0.0286	21 ppmvd as CH <sub>4</sub>	BACT Requirement; Proposed by Applicant – See equation on Page 11 below
NH <sub>3</sub>	0.05	0.0144	10 ppmvd	Required/Proposed – See equation above

NO<sub>x</sub> – 0.15 g/bhp-hr

$$0.15 \frac{\text{g NO}_x}{\text{bhp-hr}} \times \frac{1\text{lb}}{453.59\text{g}} \times \frac{1\text{hp-hr}}{2,545\text{Btu}} \times \frac{0.33\text{Btu}_{\text{out}}}{1\text{Btu}_{\text{in}}} \times \frac{10^6\text{Btu}}{1\text{MMBtu}} = 0.0429 \frac{\text{lb NO}_x}{\text{MMBtu}}$$

$$0.0429 \frac{\text{lb NO}_x}{\text{MMBtu}} \times \frac{(20.9 - 15)\% \text{O}_2}{20.9\% \text{O}_2} \times \frac{1\text{MMBtu}}{9,100\text{ft}^3} \times \frac{379.5\text{ft}^3}{\text{lb-mole}} \times \frac{\text{lb-mole}}{46\text{lb NO}_x} \times \frac{10^6\text{ppmv}}{1} = 11\text{ ppmvd NO}_x \text{ @ } 15\% \text{O}_2$$

CO – 1.75 g/bhp-hr

$$1.75 \frac{\text{g CO}}{\text{bhp-hr}} \times \frac{1\text{lb}}{453.59\text{g}} \times \frac{1\text{hp-hr}}{2,545\text{Btu}} \times \frac{0.33\text{Btu}_{\text{out}}}{1\text{Btu}_{\text{in}}} \times \frac{10^6\text{Btu}}{1\text{MMBtu}} = 0.500 \frac{\text{lb CO}}{\text{MMBtu}}$$

$$0.500 \frac{\text{lb CO}}{\text{MMBtu}} \times \frac{(20.9 - 15)\% \text{O}_2}{20.9\% \text{O}_2} \times \frac{1\text{MMBtu}}{9,100\text{ft}^3} \times \frac{379.5\text{ft}^3}{\text{lb-mole}} \times \frac{\text{lb-mole}}{28\text{lb CO}} \times \frac{10^6\text{ppmv}}{1} = 210\text{ ppmvd CO @ } 15\% \text{O}_2$$

VOC – 0.10 g/bhp-hr

$$0.10 \frac{\text{g VOC}}{\text{bhp-hr}} \times \frac{1\text{lb}}{453.59\text{g}} \times \frac{1\text{hp-hr}}{2,545\text{Btu}} \times \frac{0.33\text{Btu}_{\text{out}}}{1\text{Btu}_{\text{in}}} \times \frac{10^6\text{Btu}}{1\text{MMBtu}} = 0.0286 \frac{\text{lb VOC}}{\text{MMBtu}}$$

$$0.0286 \frac{\text{lb VOC}}{\text{MMBtu}} \times \frac{(20.9 - 15)\% \text{O}_2}{20.9\% \text{O}_2} \times \frac{1\text{MMBtu}}{9,100\text{ft}^3} \times \frac{379.5\text{ft}^3}{\text{lb-mole}} \times \frac{\text{lb-mole}}{16\text{lb VOC}} \times \frac{10^6\text{ppmv}}{1} = 21\text{ ppmvd VOC @ } 15\% \text{O}_2$$

**C. Calculations**

**1. Pre-Project Potential to Emit (PE1)**

Since the digester system and the engines are new emissions units, PE1 = 0 for all affected pollutants.

**2. Post Project Potential to Emit (PE2)**

Digester System (S-8637-1-0)

As explained above, the digester system will be composed of sealed lagoons that will reduce VOC emissions from the manure and will have negligible fugitive emissions; therefore, VOC emissions from the manure will only be attributed to Lakeview Farms dairy for manure prior to entering the digester system and when returned to the dairy and emissions from the digester system are considered negligible.

Digester Gas-Fired Engines (S-8637-2-0 and -3-0)

Daily PE2 for Each Engine during the Commissioning Period:

Daily PE during the commissioning period for each of the proposed engines is calculated in the table below:

Daily PE for Engines S-8637-2-0 &-3-0 During the Commissioning Periods								
NO <sub>x</sub>	1.0	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>77.7</b> (lb/day)
SO <sub>x</sub>	0.04	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>3.1</b> (lb/day)
PM <sub>10</sub>	0.07	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>5.4</b> (lb/day)
CO	4.85	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>376.7</b> (lb/day)
VOC	1.0	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>77.7</b> (lb/day)
NH <sub>3</sub>	0.05	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>3.9</b> (lb/day)

Daily PE2 for Each Engine during Normal Operation after the Commissioning Period:

Daily PE for each of the proposed engines during normal operation after completion of the commissioning periods is calculated in the table below:

Daily PE for Engines S-8637-2-0 &-3-0 After Commissioning								
NO <sub>x</sub>	0.15	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>11.7</b> (lb/day)
SO <sub>x</sub>	0.04	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>3.1</b> (lb/day)
PM <sub>10</sub>	0.07	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>5.4</b> (lb/day)
CO	1.75	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>135.9</b> (lb/day)
VOC	0.10	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>7.8</b> (lb/day)
NH <sub>3</sub>	0.05	(g/hp-hr) x	1,468	(hp) x	24	(hr/day) ÷	453.59 (g/lb) =	<b>3.9</b> (lb/day)

Maximum Annual PE2 for Each Engine During the first Year Including the Commissioning Periods:

As discussed above, each of the proposed engines will be allowed to operate up to 120 hours for commissioning during the first year of operation. The maximum annual PE for each engine will be calculated based on the maximum hours of operation during the commissioning period and the remaining hours during normal operation.

NO<sub>x</sub>

$$1,468 \text{ bhp} \times (1.0 \text{ g-NO}_x/\text{bhp-hr} \times 120 \text{ hr} + 0.15 \text{ g-NO}_x/\text{bhp-hr} \times 8,640 \text{ hr}) \div 453.59 \text{ g/lb} = \mathbf{4,583 \text{ lb-NO}_x}$$

SO<sub>x</sub>

$$1,468 \text{ bhp} \times (0.04 \text{ g-SO}_x/\text{bhp-hr} \times 120 \text{ hr} + 0.04 \text{ g-SO}_x/\text{bhp-hr} \times 8,640 \text{ hr}) \div 453.59 \text{ g/lb} = \mathbf{1,134 \text{ lb-SO}_x}$$

PM<sub>10</sub>

$$1,468 \text{ bhp} \times (0.07 \text{ g-PM}_{10}/\text{bhp-hr} \times 120 \text{ hr} + 0.07 \text{ g-PM}_{10}/\text{bhp-hr} \times 8,640 \text{ hr}) \div 453.59 \text{ g/lb} = \mathbf{1,985 \text{ lb-PM}_{10}}$$

CO

$$1,468 \text{ bhp} \times (4.85 \text{ g-CO}/\text{bhp-hr} \times 120 \text{ hr} + 1.75 \text{ g-CO}/\text{bhp-hr} \times 8,640 \text{ hr}) \div 453.59 \text{ g/lb} = \mathbf{50,818 \text{ lb-CO}}$$

VOC

$$1,468 \text{ bhp} \times (1.0 \text{ g-VOC/bhp-hr} \times 120 \text{ hr} + 0.10 \text{ g-VOC/bhp-hr} \times 8,640 \text{ hr}) \div 453.59 \text{ g/lb} = \mathbf{3,185 \text{ lb-VOC}}$$

NH<sub>3</sub>

$$1,468 \text{ bhp} \times (0.05 \text{ g-NH}_3\text{/bhp-hr} \times 120 \text{ hr} + 0.05 \text{ g-NH}_3\text{/bhp-hr} \times 8,640 \text{ hr}) \div 453.59 \text{ g/lb} = \mathbf{1,418 \text{ lb-NH}_3}$$

Maximum Total Combined Annual PE2 from Both Engines, Including Commissioning:

The maximum total combined annual PE2 for both the engines, including commissioning emissions, is calculated as follows:

- NO<sub>x</sub>: 4,583 lb-NO<sub>x</sub>/yr-engine x 2 engines = **9,166 lb-NO<sub>x</sub>/yr**
- SO<sub>x</sub>: 1,134 lb-SO<sub>x</sub>/yr-engine x 2 engines = **2,268 lb-SO<sub>x</sub>/yr**
- PM<sub>10</sub>: 1,985 lb-PM<sub>10</sub>/yr-engine x 2 engines = **3,970 lb-PM<sub>10</sub>/yr**
- CO: 50,818 lb-CO/yr-engine x 2 engines = **101,636 lb-CO/yr**
- VOC: 3,185 lb-VOC/yr-engine x 2 engines = **6,370 lb-VOC/yr**
- NH<sub>3</sub>: 1,418 lb-NH<sub>3</sub>/yr-engine x 2 engines = **2,836 lb-NH<sub>3</sub>/yr**

Annual PE2 for Each Engine in years with no Commissioning:

The annual PE2 for each of the engines after completion of the first year of operation when there will not be any commissioning emissions is calculated as follows:

Annual PE2 for Engines S-8637-2-0 & -3-0 with no Commissioning								
NO <sub>x</sub>	0.15	(g/hp-hr) x	1,468	(hp) x	8,760	(hr) ÷ 453.59 (g/lb) =	<b>4,253</b>	(lb/yr)
SO <sub>x</sub>	0.04	(g/hp-hr) x	1,468	(hp) x	8,760	(hr) ÷ 453.59 (g/lb) =	<b>1,134</b>	(lb/yr)
PM <sub>10</sub>	0.07	(g/hp-hr) x	1,468	(hp) x	8,760	(hr) ÷ 453.59 (g/lb) =	<b>1,985</b>	(lb/yr)
CO	1.75	(g/hp-hr) x	1,468	(hp) x	8,760	(hr) ÷ 453.59 (g/lb) =	<b>49,614</b>	(lb/yr)
VOC	0.10	(g/hp-hr) x	1,468	(hp) x	8,760	(hr) ÷ 453.59 (g/lb) =	<b>2,835</b>	(lb/yr)
NH <sub>3</sub>	0.05	(g/hp-hr) x	1,468	(hp) x	8,760	(hr) ÷ 453.59 (g/lb) =	<b>1,418</b>	(lb/yr)

Max Total Combined Annual PE2 from Both Engines in years with no Commissioning:

The maximum total combined annual PE2 for both the engines in years with no commissioning is calculated as follows:

- NO<sub>x</sub>: 4,253 lb-NO<sub>x</sub>/yr-engine x 2 engines = **8,506 lb-NO<sub>x</sub>/yr**
- SO<sub>x</sub>: 1,134 lb-SO<sub>x</sub>/yr-engine x 2 engines = **2,268 lb-SO<sub>x</sub>/yr**
- PM<sub>10</sub>: 1,985 lb-PM<sub>10</sub>/yr-engine x 2 engines = **3,970 lb-PM<sub>10</sub>/yr**
- CO: 49,614 lb-CO/yr-engine x 2 engines = **99,228 lb-CO/yr**
- VOC: 2,835 lb-VOC/yr-engine x 2 engines = **5,670 lb-VOC/yr**
- NH<sub>3</sub>: 1,418 lb-NH<sub>3</sub>/yr-engine x 2 engines = **2,836 lb-NH<sub>3</sub>/yr**

Maximum Daily and Annual PE2 from Calculations Above:

The maximum daily and annual emissions for each pollutant calculated above, including commissioning emissions, are shown in the table below.

<b>Max. Post-Project Potential to Emit (PE2) for S-8637-2-0 &amp;-3-0</b>			
	Max. Daily Emissions for each engine (lb/day)	Max. Annual Emissions for each engine (lb/year)	Max. Total Combined Annual Emissions for both engines (lb/year)
NO <sub>x</sub>	77.7	4,583	9,166
SO <sub>x</sub>	3.1	1,134	2,268
PM <sub>10</sub>	5.4	1,985	3,970
CO	376.7	50,818	101,636
VOC	77.7	3,185	6,370
NH <sub>3</sub>	3.9	1,418	2,836

### 3. Pre-Project Stationary Source Potential to Emit (SSPE1)

Pursuant to District Rule 2201, the SSPE1 is the Potential to Emit (PE) from all units with valid Authorities to Construct (ATC) or Permits to Operate (PTO) at the Stationary Source and the quantity of Emission Reduction Credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions (AER) that have occurred at the source, and which have not been used on-site.

Since this is a new facility, there are no valid ATCs, PTOs, or ERCs at the Stationary Source; therefore, the SSPE1 is equal to zero for all pollutants.

### 4. Post Project Stationary Source Potential to Emit (SSPE2)

Pursuant to District Rule 2201, the SSPE2 is the PE from all units with valid ATCs or PTOs at the Stationary Source and the quantity of ERCs which have been banked since September 19, 1991 for AER that have occurred at the source, and which have not been used on-site.

<b>SSPE2 (lb/year)</b>						
Permit Unit	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10</sub>	CO	VOC	NH <sub>3</sub>
ATC S-8637-1-0 (Digester System)	0	0	0	0	0	0
ATC S-8637-2-0 (1,468 bhp Digester Gas Engine) <sup>3</sup>	4,583	1,134	1,985	50,818	3,185	1,418
ATC S-8637-3-0 (1,468 bhp Digester Gas Engine) <sup>3</sup>	4,583	1,134	1,985	50,818	3,185	1,418
<b>SSPE2</b>	<b>9,166</b>	<b>2,268</b>	<b>3,970</b>	<b>101,636</b>	<b>6,370</b>	<b>2,836</b>

<sup>3</sup> The SSPE2 values listed in this table include the worst case annual emissions during the 120 hours of allowed commissioning time where the engines are allowed to operate uncontrolled for setup and tuning purposes. After the first year, the PE for NO<sub>x</sub>, CO, and VOC emissions will go down as the engines will no longer be allowed to operate without controls in place for these pollutants.

## 5. Major Source Determination

### Rule 2201 Major Source Determination:

Pursuant to District Rule 2201, a Major Source is a stationary source with a SSPE2 equal to or exceeding one or more of the following threshold values. For the purposes of determining major source status the following shall not be included:

- any ERCs associated with the stationary source
- Emissions from non-road IC engines (i.e. transportable IC engines at a particular site at the facility for less than 12 months)
- Fugitive emissions, except for the specific source categories specified in 40 CFR 51.165

Rule 2201 Major Source Determination (lb/year)						
	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO	VOC
SSPE1	0	0	0	0	0	0
SSPE2	9,166	2,268	3,970	3,970	101,636	6,370
Major Source Threshold	20,000	140,000	140,000	200,000*	200,000	20,000
Major Source?	No	No	No	No	No	No

\* The application for this project was deemed complete before 2/18/2016, which was when the District's PM2.5 Major Source Threshold was lowered to 140,000 lb/year

Note: PM2.5 assumed to be equal to PM10

### Rule 2410 Major Source Determination:

The facility or the equipment evaluated under this project is not listed as one of the categories specified in 40 CFR 52.21 (b)(1)(iii). Therefore the PSD Major Source threshold is 250 tons per year (tpy) for any regulated NSR pollutant.

PSD Major Source Determination (tons/year)						
	NO2	VOC	SO2	CO	PM	PM10
Estimated Facility PE before Project Increase	0	0	0	0	0	0
PSD Major Source Thresholds	250	250	250	250	250	250
PSD Major Source ? (Y/N)	N	N	N	N	N	N

Because this is a new facility, the PE for all regulated NSR pollutants prior to the project is equal to zero.



As shown above, the facility is not an existing PSD major source for any regulated NSR pollutant expected to be emitted at this facility.

## **6. Baseline Emissions (BE)**

The BE calculation (in lb/year) is performed pollutant-by-pollutant for each unit within the project to calculate the QNEC, and if applicable, to determine the amount of offsets required.

Pursuant to District Rule 2201, BE = PE1 for:

- Any unit located at a non-Major Source,
- Any Highly-Utilized Emissions Unit, located at a Major Source,
- Any Fully-Offset Emissions Unit, located at a Major Source, or
- Any Clean Emissions Unit, located at a Major Source.

otherwise,

BE = Historic Actual Emissions (HAE), calculated pursuant to District Rule 2201.

Since the proposed digester system and engines are new emissions units, BE = PE1 = 0 for all pollutants from each unit.

## **7. SB 288 Major Modification**

SB 288 Major Modification is defined in 40 CFR Part 51.165 as "any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the Act."

Since this facility is not a major source for any of the pollutants addressed in this project, this project does not constitute an SB 288 major modification.

## **8. Federal Major Modification**

District Rule 2201 states that a Federal Major Modification is the same as a "Major Modification" as defined in 40 CFR 51.165 and part D of Title I of the CAA.

Since this facility is not a Major Source for any pollutants, this project does not constitute a Federal Major Modification. Additionally, since the facility is not a major source for PM<sub>10</sub> (140,000 lb/year), it is not a major source for PM<sub>2.5</sub> (200,000 lb/year since the application for the project was deemed complete before 2/18/2016).

## **9. Rule 2410 – Prevention of Significant Deterioration (PSD) Applicability Determination**

Rule 2410 applies to any pollutant regulated under the Clean Air Act, except those for which the District has been classified nonattainment. The pollutants which must be addressed in the PSD applicability determination for sources located in the SJV and which are emitted in this project are: (See 52.21 (b) (23) definition of significant)

- NO2 (as a primary pollutant)
- SO2 (as a primary pollutant)
- CO
- PM
- PM10
- Hydrogen sulfide (H2S)<sup>4</sup>
- Total reduced sulfur (including H2S)<sup>4</sup>

**I. Project Emissions Increase - New Major Source Determination**

The post-project potentials to emit from all new and modified units are compared to the PSD major source thresholds to determine if the project constitutes a new major source subject to PSD requirements.

The facility or the equipment evaluated under this project is not listed as one of the categories specified in 40 CFR 52.21 (b)(1)(i). The PSD Major Source threshold is 250 tons per year (tpy) for any regulated NSR pollutant.

<b>PSD Major Source Determination: Potential to Emit (tons/year)</b>						
	NO2	VOC	SO2	CO	PM	PM10
Total PE from New and Modified Units	4.6	3.2	1.1	50.8	2.0	2.0
PSD Major Source threshold	250	250	250	250	250	250
New PSD Major Source?	N	N	N	N	N	N

As shown in the table above, the potential to emit for the project, by itself, does not exceed any PSD major source threshold. Therefore Rule 2410 is not applicable and no further analysis is required.

**10. Quarterly Net Emissions Change (QNEC)**

The QNEC is calculated solely to establish emissions that are used to complete the District's PAS emissions profile screen. Detailed QNEC calculations are included in Appendix A.

<sup>4</sup> Because the facility is not included in the specific source categories listed in 40 CFR 51.165, for PSD purposes only non-fugitive emissions from the engine exhaust stacks must be addressed for this project. Although the sulfur (primarily H<sub>2</sub>S) in the fuel will be converted almost entirely to SO<sub>x</sub> during combustion, the maximum possible amount of H<sub>2</sub>S and total reduced sulfur compounds from the engine stacks can be calculated by assuming that all sulfur in the fuel is emitted as H<sub>2</sub>S. Based on the fuel sulfur limit of 40 ppmv as H<sub>2</sub>S, the maximum possible H<sub>2</sub>S emission factor for the engines is calculated to be 0.02 g-H<sub>2</sub>S/bhp (0.0056 lb-H<sub>2</sub>S/MMBtu), resulting in a total combined maximum of < 0.06 tpy H<sub>2</sub>S from the exhaust stacks of both engines. This is well below the applicable PSD threshold of 250 tpy.

## VIII. Compliance

### Rule 2201 New and Modified Stationary Source Review Rule

#### A. Best Available Control Technology (BACT)

##### 1. BACT Applicability

BACT requirements are triggered on a pollutant-by-pollutant basis and on an emissions unit-by-emissions unit basis. Unless specifically exempted by Rule 2201, BACT shall be required for the following actions\*:

- a. Any new emissions unit with a potential to emit exceeding two pounds per day,
- b. The relocation from one Stationary Source to another of an existing emissions unit with a potential to emit exceeding two pounds per day,
- c. Modifications to an existing emissions unit with a valid Permit to Operate resulting in an AIPE exceeding two pounds per day, and/or
- d. Any new or modified emissions unit, in a stationary source project, which results in an SB 288 Major Modification or a Federal Major Modification, as defined by the rule.

\*Except for CO emissions from a new or modified emissions unit at a Stationary Source with an SSPE2 of less than 200,000 pounds per year of CO.

##### a. New emissions units – PE > 2 lb/day

As seen in Section VII.C.2 above, the applicant is proposing to install a new digester system with and two new digester gas-fired IC engines.

##### Digester System (S-8637-1-0)

As explained above, the digester system will consist of sealed lagoon(s) that will reduce VOC emissions from the manure at the dairy and emissions from the digester system are considered negligible. Therefore BACT for new units with PE > 2 lb/day purposes is not required for the digester system.

##### Digester Gas-Fired Engines (S-8637-2-0 and -3-0)

The proposed engines will each have a PE greater than 2.0 lb/day for NO<sub>x</sub>, SO<sub>x</sub>, PM<sub>10</sub>, CO, VOC, and NH<sub>3</sub>. Therefore, BACT is triggered for NO<sub>x</sub>, SO<sub>x</sub>, PM<sub>10</sub>, and VOC. As part of the BACT requirements, NH<sub>3</sub> slip from the SCR systems will also be limited. The PE for CO from each unit also exceeds 2.0 lb/day; however, BACT is not triggered for CO since the SSPE2 for CO is not greater than 200,000 lbs/year, as demonstrated in Section VII.C.5 above.

**b. Relocation of emissions units – PE > 2 lb/day**

As discussed in Section I above, there are no emissions units being relocated from one stationary source to another; therefore BACT is not triggered for relocation of an emissions unit.

**c. Modification of emissions units – AIPE > 2 lb/day**

As discussed in Section I above, there are no modified emissions units associated with this project. Therefore, BACT is not triggered for modification of a unit.

**d. SB 288/Federal Major Modification**

As discussed in Sections VII.C.7 and VII.C.8 above, this project does not constitute an SB 288 or Federal Major Modification. Therefore BACT is not triggered for Major Modification purposes.

**2. BACT Guideline**

S-8637-2-0 & -3-0

BACT Guideline 3.3.15 applies to the proposed digester gas-fired IC engines. (See Appendix B)

**3. Top-Down BACT Analysis**

Pursuant to the Top-Down BACT Analysis (See Appendix B), BACT has been satisfied with the following:

- NO<sub>x</sub>: NO<sub>x</sub> emissions ≤ 0.15 g/bhp-hr
- SO<sub>x</sub>: Fuel sulfur content ≤ 40 ppmv (as H<sub>2</sub>S)
- PM<sub>10</sub>: Fuel sulfur content ≤ 40 ppmv (as H<sub>2</sub>S)
- VOC: VOC emissions ≤ 0.10 g/bhp-hr
- NH<sub>3</sub>: NH<sub>3</sub> slip emissions ≤ 10 ppmv @ 15% O<sub>2</sub>

**B. Offsets**

**1. Offset Applicability**

Offset requirements shall be triggered on a pollutant by pollutant basis and shall be required if the SSPE2 equals to or exceeds the offset threshold levels in Table 4-1 of Rule 2201.

The SSPE2 is compared to the offset thresholds in the following table.

<b>Offset Determination (lb/year)</b>					
	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10</sub>	CO	VOC
SSPE2	9,166	2,268	3,970	101,636	6,370
Offset Thresholds	20,000	54,750	29,200	200,000	20,000
Offsets triggered?	No	No	No	No	No

## 2. Quantity of Offsets Required

As seen above, the SSPE2 is not greater than the offset thresholds for all the pollutants; therefore offset calculations are not necessary and offsets will not be required for this project.

## C. Public Notification

### 1. Applicability

Public noticing is required for:

- a. New Major Sources, Federal Major Modifications, and SB 288 Major Modifications,
- b. Any new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one pollutant,
- c. Any project which results in the offset thresholds being surpassed, and/or
- d. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant.
- e. Any project which results in a Title V significant permit modification

#### a. New Major Sources, Federal Major Modifications, and SB 288 Major Modifications

New Major Sources are new facilities, which are also Major Sources. As shown in Section VII.C.5 above, the SSPE2 is not greater than the Major Source threshold for any pollutant. Therefore, public noticing is not required for this project for new Major Source purposes.

As demonstrated in Sections VII.C.7 and VII.C.8, this project does not constitute an SB 288 or Federal Major Modification; therefore, public noticing for SB 288 or Federal Major Modification purposes is not required.

#### b. PE > 100 lb/day

Applications which include a new emissions unit with a PE greater than 100 pounds during any one day for any pollutant will trigger public noticing requirements.

The PE2 for the proposed new IC engines is compared to the daily PE Public Notice thresholds in the following table:

Digester Gas-Fired IC Engines (S-8637-2-0 & -3-0)

<b>PE &gt; 100 lb/day Public Notice Thresholds</b>			
Pollutant	PE2 (lb/day)	Public Notice Threshold	Public Notice Triggered?
NO <sub>x</sub>	77.7	100 lb/day	No
SO <sub>x</sub>	3.1	100 lb/day	No
PM <sub>10</sub>	5.4	100 lb/day	No
CO	376.7	100 lb/day	<b>Yes</b>
VOC	77.7	100 lb/day	No
NH <sub>3</sub>	3.9	100 lb/day	No

Therefore, public noticing for PE > 100 lb/day purposes is required.

**c. Offset Threshold**

The SSPE1 and SSPE2 are compared to the offset thresholds in the following table.

<b>Offset Thresholds</b>				
Pollutant	SSPE1 (lb/year)	SSPE2 (lb/year)	Offset Threshold	Public Notice Required?
NO <sub>x</sub>	0	9,166	20,000 lb/year	No
SO <sub>x</sub>	0	2,268	54,750 lb/year	No
PM <sub>10</sub>	0	3,970	29,200 lb/year	No
CO	0	101,636	200,000 lb/year	No
VOC	0	6,370	20,000 lb/year	No

As detailed above, there were no thresholds surpassed with this project; therefore public noticing is not required for surpassing an offset threshold.

**d. SSIPE > 20,000 lb/year**

Public notification is required for any permitting action that results in a SSIPE of more than 20,000 lb/year of any affected pollutant. According to District policy, the SSIPE = SSPE2 – SSPE1. The SSIPE is compared to the SSIPE Public Notice thresholds in the following table.

<b>SSIPE Public Notice Thresholds</b>					
Pollutant	SSPE2 (lb/year)	SSPE1 (lb/year)	SSIPE (lb/year)	SSIPE Public Notice Threshold	Public Notice Required?
NO <sub>x</sub>	9,166	0	9,166	20,000 lb/year	No
SO <sub>x</sub>	2,268	0	2,268	20,000 lb/year	No
PM <sub>10</sub>	3,970	0	3,970	20,000 lb/year	No
CO	101,636	0	101,636	20,000 lb/year	<b>Yes</b>
VOC	6,370	0	6,370	20,000 lb/year	No
NH <sub>3</sub>	2,836	0	2,836	20,000 lb/year	No

As demonstrated above, the SSIPE for CO was greater than 20,000 lb/year; therefore public noticing for SSIPE > 20,000 lbs is required.

#### **e. Title V Significant Permit Modification**

Since this facility does not have a Title V operating, this change is not a Title V Significant Modification, and therefore public noticing is not required.

### **2. Public Notice Action**

As discussed above, public noticing is required for this project for CO emissions from an emissions unit in excess of 100 lb/day and for an SSIPE for CO that exceeds 20,000 lb/yr. Therefore, public notice documents will be submitted to the California Air Resources Board (ARB) and a public notice will be published in a local newspaper of general circulation prior to the issuance of the ATC for this equipment.

### **D. Daily Emission Limits (DELs)**

DELs and other enforceable conditions are required by Rule 2201 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. The DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and must be enforceable, in a practicable manner, on a daily basis. DELs are also required to enforce the applicability of BACT.

#### **Proposed Rule 2201 (DEL) Conditions for the Digester System (S-8637-1-0)**

As stated above, the digester system will reduce emissions from the manure produced by cattle at Lakeview Farms dairy. The following condition will be placed on the ATC permit to ensure that fugitive emissions from the digester system will be negligible:

- The VOC content of the digester gas produced by the digester system shall not exceed 10% by weight. [District Rule 2201]
- The air injection system shall be maintained and operated in accordance with the supplier's recommendations to minimize the concentration of hydrogen sulfide (H<sub>2</sub>S) in the digester gas. [District Rule 2201]

#### **Proposed Rule 2201 (DEL) Conditions for the Digester Gas-Fired Engines (S-8637-2-0 & -3-0)**

Proposed Rule 2201 (DEL) Conditions for Engines during Both Commissioning and Normal Operation:

- This engine shall only be fueled with digester gas except in the case that sufficient digester gas is unavailable for the engine at the time that the required one-time initial utility interconnect testing is scheduled. If sufficient digester gas is unavailable for the engine at the time that the required initial utility interconnect testing is scheduled, the engine will be permitted to use sufficient natural gas fuel to complete the required utility interconnect testing. [District Rule 2201]

- During times this engine is fueled with natural gas for required initial utility interconnect testing, the engine shall continue to comply with all emission standards and limitations contained in this permit. [District Rule 2201]
- The total amount of electrical energy produced by this engine while fueled on natural gas for required one-time initial utility interconnect testing shall not exceed 96,000 kW-hrs. The following records shall be maintained: 1) date(s) and time(s) that this engine is fueled with natural gas for utility testing, 2) the total amount of electrical energy (kW-hr) produced by this engine when fueled with natural gas for utility testing, and 3) the total number of hours that this engine is fueled with natural gas. [District Rule 2201]
- The sulfur content of the digester gas used as fuel in this engine shall not exceed 40 ppmv as H<sub>2</sub>S. The applicant may utilize an averaging period of up to 24 hours in length for demonstration of compliance with the fuel sulfur content limit. [District Rules 2201, 4102, 4702, and 4801]
- Ammonia (NH<sub>3</sub>) emissions from this engine shall not exceed 10 ppmvd @ 15% O<sub>2</sub>. [District Rule 2201]

Proposed Rule 2201 (DEL) Conditions during Commissioning Period:

For these digester gas-fired IC engines, the DELs for NO<sub>x</sub>, PM<sub>10</sub>, CO, and VOC are stated in the form of maximum emission factors (g/bhp-hr) and maximum number of hours allowed for commissioning activities.

- Commissioning period shall commence when all mechanical, electrical, and control systems are installed and individual system startup has been completed, or when the reciprocating engine is first fired, whichever occurs first. The commissioning period shall terminate when the engine has completed initial performance testing, completed initial engine tuning, and the engine is available for commercial operation. The total duration of the commissioning period for this engine shall not exceed 120 hours of operation. [District Rule 2201]
- The owner/operator shall minimize the emissions from the engine to the maximum extent possible during the commissioning period. [District Rule 2201]
- During the commissioning period emission rates from this IC engine shall not exceed any of the following limits: 1.0 g-NO<sub>x</sub>/bhp-hr, 0.07 g-PM<sub>10</sub>/bhp-hr, 4.85 g-CO/bhp-hr, 1.0 g-VOC/bhp-hr. [District Rule 2201]
- The total number of firing hours of this unit without abatement of emissions by the SCR system shall not exceed 120 hours during the commissioning period. Such operation of this unit without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system. Upon completion of these activities, the unused balance of the 120 firing hours without abatement shall expire. [District Rule 2201]

Proposed Rule 2201 (DEL) Conditions during Normal Operation:

For the proposed digester gas-fired IC engines, the DELs for NO<sub>x</sub>, PM<sub>10</sub>, CO, and VOC during normal operation are stated in the form of emission factors (g/hp-hr & ppmv), the



maximum engine horsepower rating (1,468 bhp), and the maximum operational time of 24 hours per day.

- Coincident with the end of the commissioning period, emissions from this IC engine shall not exceed any of the following limits: 0.15 g-NO<sub>x</sub>/bhp-hr (for periodic alternate monitoring, equivalent to 11 ppmvd NO<sub>x</sub> @ 15% O<sub>2</sub>), NO<sub>x</sub> referenced as NO<sub>2</sub>; 0.07 g-PM<sub>10</sub>/bhp-hr; 1.75 g-CO/bhp-hr (for periodic alternate monitoring, equivalent to 210 ppmvd CO @ 15% O<sub>2</sub>); 0.10 g-VOC/bhp-hr (for periodic alternate monitoring, equivalent to 21 ppmvd VOC @ 15% O<sub>2</sub>), VOC referenced as CH<sub>4</sub>. [District Rules 2201 and 4702]

## **E. Compliance Assurance**

### **1. Source Testing**

The proposed 1,468 bhp digester gas-fired engines are subject to District Rule 4702 - Internal Combustion Engines. Section 6.3.2.1 of District Rule 4702 requires source testing of NO<sub>x</sub>, CO, and VOC emissions at least once every 24 months for a non-agricultural spark-ignited IC engine. The periodic source testing required by District Rule 4702 will ensure compliance with the applicable New Source Review (NSR) requirements NO<sub>x</sub>, CO, and VOC. Therefore, source testing for NO<sub>x</sub>, CO, and VOC will be required within 90 days of initial start-up and at least once 24 months thereafter. Since the control equipment will include an SCR system, periodic testing of ammonia slip will also be required. In addition, Section 5.10.1 of District Rule 4702 requires an annual analysis of the sulfur content of engine fuel. The PM<sub>10</sub> emissions from the engine are not expected to change much over time as long as the quality of the gas used to fuel the engines remains consistent. The facility will be required to periodically monitor the sulfur content of the digester gas fuel, which should ensure that the quality of the digester gas fuel is consistent. Therefore, initial PM<sub>10</sub> source testing will be required to demonstrate compliance with the PM<sub>10</sub> emission limit, but ongoing PM<sub>10</sub> source testing will not be required.

The proposed engines are also subject to 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. However, the District has not been delegated the authority to implement 40 CFR 60, Subpart JJJJ for non-Major Sources; therefore, no testing requirements from this subpart will be included in the ATC permits. However, the applicant will be responsible for compliance with the applicable requirements of this regulation.

The following conditions will be placed on the engine permits to ensure compliance:

- Source testing to measure NO<sub>x</sub>, CO, VOC, PM<sub>10</sub>, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted within 90 days of initial start-up. [District Rules 1081, 2201, and 4702]
- Source testing to measure NO<sub>x</sub>, CO, VOC, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted at least once every 24 months. [District Rules 1081, 2201, and 4702]

- {3791} Emissions source testing shall be conducted with the engine operating either at conditions representative of normal operations or conditions specified in the Permit to Operate. [District Rule 4702]
- For emissions source testing, the arithmetic average of three 30-consecutive-minute test runs shall apply. If two of three runs are above an applicable limit, the test cannot be used to demonstrate compliance with an applicable limit. VOC emissions shall be reported as methane. NO<sub>x</sub>, CO, VOC, and NH<sub>3</sub> concentrations shall be reported in ppmv, corrected to 15% oxygen. [District Rules 2201 and 4702]
- The following methods shall be used for source testing: NO<sub>x</sub> (ppmv) - EPA Method 7E or ARB Method 100; CO (ppmv) - EPA Method 10 or ARB Method 100; VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100; stack gas oxygen - EPA Method 3 or 3A or ARB Method 100; stack gas velocity - EPA Method 2 or EPA Method 19; stack gas moisture content - EPA Method 4; PM<sub>10</sub> (filterable and condensable) - EPA Method 201 and 202, EPA Method 201a and 202, or ARB Method 5 in combination with Method 501; NH<sub>3</sub> - BAAQMD ST-1B or SCAQMD Method 207-1. Alternative test methods as approved by the District may also be used to address the source testing requirements of this permit. [District Rules 1081 and 4702]
- Fuel sulfur content analysis shall be performed within 90 days of initial start-up using EPA Method 11 or EPA Method 15, as appropriate. [District Rules 2201 and 4702]
- Fuel sulfur analysis shall be performed at least annually using EPA Method 11 or EPA Method 15, as appropriate. Records of the fuel sulfur analysis shall be maintained and provided it to the District upon request. [District Rules 2201 and 4702]
- {109} Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified at least 30 days prior to any compliance source test, and a source test plan must be submitted for approval at least 15 days prior to testing. [District Rule 1081]
- The results of each source test shall be submitted to the District within 60 days after completion of the source test. [District Rule 1081]

## 2. Monitoring

As stated above the engines are subject to District Rule 4702. Section 5.8.1 of District Rule 4702 requires engines rated at least 1,000 bhp that can operate more than 2,000 hour per calendar year or equipped with external control devices to install, operate, and maintain an APCO-approved alternate monitoring plan. Section 5.8.9 of District Rule 4702 requires monitoring of NO<sub>x</sub> emissions at least once every calendar quarter for a non-agricultural spark-ignited IC engine. Therefore, quarterly monitoring of NO<sub>x</sub>, CO, and O<sub>2</sub> concentrations in accordance with pre-approved alternate monitoring plan "A" within District Policy SSP 1810 will be required. Since the engines will be equipped with SCR, quarterly monitoring of ammonia slip will also be required.

The following conditions will be placed on the engine permits to ensure compliance:

- The permittee shall monitor and record the stack concentration of NO<sub>x</sub>, CO, and O<sub>2</sub> at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack monitors may be allowed if they satisfy the standards for portable analyzers as specified in District policies and are approved in writing by the APCO.] Monitoring shall be performed not less than once every month for 12 months if two consecutive deviations are observed during quarterly monitoring. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the engine unless monitoring has been performed within the last month if on a monthly monitoring schedule, or within the last quarter if on a quarterly monitoring schedule. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 2201 and 4702]
- The permittee shall monitor and record the stack concentration of NH<sub>3</sub> at least once every calendar quarter in which a source test is not performed. NH<sub>3</sub> monitoring shall be conducted utilizing District approved gas-detection tubes or a District approved equivalent method. Monitoring shall not be required if the unit is not in operation, i.e. the unit need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the unit unless monitoring has been performed within the last quarter. [District Rules 2201 and 4102]
- If the NO<sub>x</sub>, CO, or NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, as measured by the portable analyzer or the District-approved ammonia monitoring equipment, exceed the respective permitted emissions concentration(s), the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 8 hours of operation after detection. If the portable analyzer or ammonia monitoring equipment readings continue to exceed the permitted emissions concentration(s) after 8 hours of operation after detection, the permittee shall notify the District within the following 1 hour and conduct a certified source test within 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of the performing the notification and testing required by this condition. [District Rules 2201 and 4702]
- {3787} All alternate monitoring parameter emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rule 4702]

Because of the variable composition of digester gas, additional monitoring of the fuel sulfur content of the digester gas will be required. The following conditions will be placed on the engine permits to ensure compliance:

- The sulfur content of the digester gas used to fuel the engine shall be monitored and recorded at least once every calendar quarter in which a fuel sulfur analysis is not performed. If quarterly monitoring shows a violation of the fuel sulfur content limit of this permit, monthly monitoring will be required until six consecutive months of monitoring show compliance with the fuel sulfur content limit. Once compliance with the fuel sulfur content limit is shown for six consecutive months, then the monitoring frequency may return to quarterly. Monitoring of the sulfur content of the digester gas fuel shall not be required if the engine does not operate during that period. Records of the results of monitoring of the digester gas fuel sulfur content shall be maintained. [District Rule 2201]
- Monitoring of the digester gas sulfur content shall be performed using gas detection tubes calibrated for H<sub>2</sub>S; a Testo 350 XL portable emission monitor; a continuous fuel gas monitor that meets the requirements specified in SCAQMD Rule 431.1, Attachment A; District-approved source test methods, including EPA Method 15, ASTM Method D1072, D4084, and D5504; District-approved in-line H<sub>2</sub>S monitors; or an alternative method approved by the District. Prior to utilization of in-line monitors to demonstrate compliance with the digester gas sulfur content limit of this permit, the permittee shall submit details of the proposed monitoring system, including the make, model, and detection limits, to the District and obtain District approval for the proposed monitor(s). [District Rule 2201]

### **3. Recordkeeping**

Recordkeeping is required to demonstrate compliance with the offset, public notification and daily emission limit requirements of Rule 2201.

The following conditions will be listed on the engine permits:

- The SCR catalyst shall be maintained and replaced in accordance with the recommendations of the catalyst manufacturer or emission control supplier. Records of catalyst maintenance and replacement shall be maintained. [District Rules 2201 and 4702]
- The permittee shall maintain records of: (1) the date and time of NO<sub>x</sub>, CO, O<sub>2</sub>, and NH<sub>3</sub> measurements, (2) the O<sub>2</sub> concentration in percent and the measured NO<sub>x</sub>, CO, and NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, (5) the method of determining the NH<sub>3</sub> emission concentration, and (6) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 2201 and 4702]
- The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: the total hours of operation, the type and quantity of fuel used, maintenance and modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. Quantity of fuel used shall be recorded in standard cubic feet using a non-resettable, totalizing mass or

volumetric fuel flow meter or other APCO approved-device. [District Rules 2201 and 4702]

- All records shall be maintained and retained for a minimum of five (5) years, and shall be made available for District inspection upon request. All records may be maintained and submitted in an electronic format approved by the District. [District Rules 2201 and 4702]

#### 4. Reporting

No reporting is required to demonstrate compliance with District Rule 2201.

As stated above, the proposed 1,468 bhp engines are subject to 40 CFR 60, Subpart JJJJ. 40 CFR 60, Subpart JJJJ requires uncertified engines rated 500 bhp or more to submit an initial notification to EPA. As explained above, the District has not been delegated the authority to implement this regulation for non-Major Sources; therefore, this requirement will not be included in the ATC permits. However, the applicant will be responsible for compliance with the applicable requirements of this regulation.

#### F. Ambient Air Quality Analysis (AAQA)

District Rule 2201 requires that an ambient air quality analysis (AAQA) be conducted for the purpose of determining whether a new or modified Stationary Source will cause or make worse a violation of an air quality standard. The Technical Services Division of the SJVAPCD conducted the required analysis. Refer to Appendix C of this document for the AAQA summary sheet.

The proposed location is in an attainment area for NO<sub>x</sub>, CO, and SO<sub>x</sub>. As shown by the AAQA summary sheet the proposed equipment will not cause a violation of an air quality standard for NO<sub>x</sub>, CO, or SO<sub>x</sub>. The proposed location is in a non-attainment area for the state's PM<sub>10</sub> as well as federal and state PM<sub>2.5</sub> thresholds.

The results of the Criteria Pollutant Modeling conducted for the AAQA are summarized in the following table:

Criteria Pollutant Modeling Results*					
Digester Gas-Fired IC Engines	1 Hour	3 Hours	8 Hours.	24 Hours	Annual
CO	Pass	X	Pass	X	X
NO <sub>x</sub>	Pass <sup>1</sup>	X	X	X	Pass
SO <sub>x</sub>	Pass	Pass	X	Pass	Pass
PM <sub>10</sub>	X	X	X	Pass <sup>2</sup>	Pass <sup>2</sup>
H <sub>2</sub> S	Pass	X	X	X	X

\* Results were taken from the PSD spreadsheet.

<sup>1</sup> The project was compared to the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard that became effective on April 12, 2010 using the District's approved procedures.

<sup>2</sup> The criteria pollutants are below EPA's level of significance as found in 40 CFR Part 51.165 (b)(2).

<sup>3</sup> H<sub>2</sub>S emissions must be limited to the value listed in the Proposed Permit Conditions section in order for this project to not cause an exceedance of the California Ambient Air Quality Standard (CAAQS).

### **Rule 2410 Prevention of Significant Deterioration**

As shown in Section VII. C. 9. above, this project does not result in a new PSD major source or PSD major modification. No further discussion is required.

### **Rule 2520 Federally Mandated Operating Permits**

Since this facility's potential emissions do not exceed any major source thresholds of Rule 2201, this facility is not a major source, and Rule 2520 does not apply.

### **Rule 4101 Visible Emissions**

Rule 4101 states that no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity.

Since the IC engines are fired solely on gaseous fuel, visible emissions are not expected to exceed Ringelmann 1 or 20% opacity.

The following condition will be listed on the proposed ATC permits to ensure compliance:

- {15} No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101]

### **Rule 4102 Nuisance**

Rule 4102 prohibits discharge of air contaminants which could cause injury, detriment, nuisance or annoyance to the public. Public nuisance conditions are not expected as a result of these operations, provided the equipment is well maintained. Therefore, compliance with this rule is expected.

### **California Health & Safety Code 41700 (Health Risk Assessment)**

District Policy APR 1905 – *Risk Management Policy for Permitting New and Modified Sources* specifies that for an increase in emissions associated with a proposed new source or modification, the District perform an analysis to determine the possible impact to the nearest resident or worksite.

A Health Risk Assessment (HRA) is not required for a project with a total facility prioritization score of less than one. According to the Technical Services Memo for this project (Appendix C), the total facility prioritization score including this project was greater than one. Therefore, an HRA was required to determine the short-term acute and long-term chronic exposure from this project. The results of the health risk assessment are summarized in the table below.

<b>RMR Summary</b>			
<b>Categories</b>	<b>1,468 bhp Digester Gas-Fired IC Engines (S-8637-2-0 &amp; -3-0)</b>	<b>Project Totals</b>	<b>Facility Totals</b>
<b>Prioritization Score<sup>1</sup></b>	107 (each)	214	>1
<b>Acute Hazard Index</b>	0.48 (each) <sup>1</sup>	0.95	0.95
<b>Chronic Hazard Index</b>	0.16 (each)	0.31	0.31
<b>Maximum Individual Cancer Risk (10<sup>-6</sup>)</b>	0.002 (each)	0.004	0.004
<b>T-BACT Required?</b>	<b>No</b>		
<b>Special Permit Conditions?</b>	<b>Yes</b>		

H<sub>2</sub>S emissions must be limited in order to achieve the acute hazard index score in this project and for the project to not cause an exceedance of the California Ambient Air Quality Standard (CAAQS). Please see special condition below.

### Discussion of T-BACT

BACT for toxic emission control (T-BACT) is required if the cancer risk exceeds one in one million. As demonstrated above, T-BACT is not required for this project because the HRA indicates that the risk is not above the District's thresholds for triggering T-BACT requirements; therefore, compliance with the District's Risk Management Policy is expected.

District policy APR 1905 also specifies that the increase in emissions associated with a proposed new source or modification not have acute or chronic indices, or a cancer risk greater than the District's significance levels (i.e. acute and/or chronic indices greater than 1 and a cancer risk greater than 20 in a million). As outlined by the HRA Summary in Appendix C of this report, the emissions increases for this project was determined to be less than significant.

To ensure compliance with the HRA; the following condition will be listed on the engine permits:

#### Digester Gas-Fired IC Engines (S-8637-2-0 & -3-0)

- The sulfur content of the digester gas used as fuel in this engine shall not exceed 40 ppmv as H<sub>2</sub>S. The applicant may utilize an averaging period of up to 24 hours in length for demonstration of compliance with the fuel sulfur content limit. [District Rules 2201, 4102, 4702, and 4801]

This condition, along with the engine rating in the equipment description, will ensure that the H<sub>2</sub>S emissions from the engine exhaust stack shall not exceed 1.97 lb/hr, as required by the Health Risk Assessment.

### Rule 4201 Particulate Matter Concentration

The purpose of this rule is to protect the ambient air quality by establishing a particulate matter emission standard. Section 3.1 prohibits discharge of dust, fumes, or total particulate matter

into the atmosphere from any single source operation in excess of 0.1 grain per dry standard cubic foot.

$$0.07 \frac{g}{hp \cdot hr} \times \frac{1hp \cdot hr}{2,545Btu} \times \frac{10^6 Btu}{9,100dscf} \times \frac{0.33Btu_{out}}{1Btu_{in}} \times \frac{15.43grain}{g} = 0.015 \frac{grain}{dscf}$$

Since 0.015 grain/dscf is less than 0.1 grain/dscf, compliance with this rule is expected.

The following condition will be listed on the proposed ATC permits to ensure compliance:

- {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]

### Rule 4701 Stationary Internal Combustion Engines – Phase I

The requirements of Rule 4702 are equivalent or more stringent than the requirements of this Rule. Since the proposed IC engines are subject to both Rules 4701 and 4702, compliance with Rule 4702 is sufficient to demonstrate compliance with this rule.

### Rule 4702 Internal Combustion Engines

The purpose of this rule is to limit the emissions of nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compounds (VOC), and sulfur oxides (SO<sub>x</sub>) from internal combustion engines.

This rule applies to any internal combustion engine with a rated brake horsepower of 25 brake horsepower or greater.

Section 5.2.1 requires that the operator of a spark-ignited non-agricultural internal combustion engine rated > 50 bhp shall not operate it in such a manner that results in emissions exceeding the limits in Table 1 of Rule 4702 until such time that the engine has demonstrated compliance with emission limits in Table 2 of Rule 4702 pursuant to the compliance deadlines in Section 7.5. In lieu of complying with Table 1 emission limits, the operator of a spark-ignited engine shall comply with the applicable emission limits pursuant to Section 8.0. The proposed new engines are required to immediately comply with the emission limits contained in Table 2 since the applicable compliance dates have passed (except for an operator with at least 12 existing engines at one stationary source); therefore, the emissions limits in Table 1 of Rule 4702 are not applicable to the proposed engines.

Section 5.2.2 requires that on and after the compliance schedule specified in Section 7.5, the operator of a spark-ignited non-agricultural internal combustion engine rated > 50 bhp shall comply with all the applicable requirements of the rule and the requirements of Section 5.2.2.1, 5.2.2.2, or 5.2.2.3, on an engine-by-engine basis.

Section 5.2.2.1 requires that on and after the compliance schedule specified in Section 7.5, the operator of a spark-ignited engine that is used exclusively in non-agricultural operations shall comply with Sections 5.2.2.1.1 through 5.2.2.1.3 on an engine-by-engine basis:

- 5.2.2.1.1 NO<sub>x</sub>, CO, and VOC emission limits pursuant to Table 2;
- 5.2.2.1.2 SO<sub>x</sub> control requirements of Section 5.7, pursuant to the deadlines specified in Section 7.5; and



5.2.2.1.3 Monitoring requirements of Section 5.10, pursuant to the deadlines specified in Section 7.5.

Section 5.2.2.2 allows that in lieu of complying with the NO<sub>x</sub> emission limit requirement of Section 5.2.2.1.1, an operator may pay an annual fee to the District, as specified in Section 5.6, pursuant to Section 7.6. Pursuant to Section 5.2.2.2.1, engines in the fee payment program shall have actual emissions not greater than the applicable limits in Table 1 during the entire time the engine is part of the fee payment program. Pursuant to Section 5.2.2.2.2, compliance with Section 5.7 and 5.10, pursuant to the deadlines specified in Section 7.5, is also required as part of the fee payment option.

Section 5.2.2.3 allows that in lieu of complying with the NO<sub>x</sub>, CO, and VOC limits of Table 2 on an engine-by-engine basis, an operator may elect to implement an alternative emission control plan pursuant to Section 8.0. An operator electing this option shall not be eligible to participate in the fee payment option outlined in Section 5.2.2.2 and Section 5.6.

<b>Rule 4702, Table 2 Emission Limits/Standards for Spark-Ignited IC Engines rated &gt;50 bhp Used in Non-Agricultural Operations</b>			
(Emission Limits are effective according to the compliance schedule specified in Rule 4702, Section 7.5.)			
<b>Engine Type</b>	<b>NO<sub>x</sub> Emission Limit (ppmv @ 15% O<sub>2</sub>, dry)</b>	<b>CO Emission Limit (ppmv @ 15% O<sub>2</sub>, dry)</b>	<b>VOC Emission Limit (ppmv @ 15% O<sub>2</sub>, dry)</b>
1. a. Rich-Burn, Waste Gas Fueled	50 ppmv	2,000 ppmv	250 ppmv
1. b. Rich-Burn, Cyclic Loaded, Field Gas Fueled	50 ppmv	2,000 ppmv	250 ppmv
1. c. Rich-Burn, Limited Use	25 ppmv	2,000 ppmv	250 ppmv
1. d. Rich-Burn, Not Listed Above	11 ppmv	2,000 ppmv	250 ppmv
2. a. Lean-Burn, 2-Stroke, Gaseous Fueled, >50 bhp & <100 bhp	75 ppmv	2,000 ppmv	750 ppmv
2. b. Lean-Burn, Limited Use	65 ppmv	2,000 ppmv	750 ppmv
2. c. Lean-Burn Engine used for gas compression	65 ppmv or 93% reduction	2,000 ppmv	750 ppmv
2. d. Waste Gas Fueled	65 ppmv or 90% reduction	2,000 ppmv	750 ppmv
2. e. Lean-Burn, Not Listed Above	11 ppmv	2,000 ppmv	750 ppmv

The proposed digester gas-fired engines will be operated as a separate stationary source than the dairy farm and the District has determined that the IC engines are a non-agricultural IC engines. The digester gas-fired, engines are waste gas-fired engines and are required to

comply with the following emissions limits from Table 2, Row 2.d: 65 ppmvd NO<sub>x</sub>, 2,000 ppmvd CO, and 750 ppmvd VOC (all measured @ 15% O<sub>2</sub>).

Therefore, the following previously presented condition will be listed on the proposed ATC permits for the engines to ensure compliance:

- Coincident with the end of the commissioning period, emissions from this IC engine shall not exceed any of the following limits: 0.15 g-NO<sub>x</sub>/bhp-hr (for periodic alternate monitoring, equivalent to 11 ppmvd NO<sub>x</sub> @ 15% O<sub>2</sub>), NO<sub>x</sub> referenced as NO<sub>2</sub>; 0.07 g-PM<sub>10</sub>/bhp-hr; 1.75 g-CO/bhp-hr (for periodic alternate monitoring, equivalent to 210 ppmvd CO @ 15% O<sub>2</sub>); 0.10 g-VOC/bhp-hr (for periodic alternate monitoring, equivalent to 21 ppmvd VOC @ 15% O<sub>2</sub>), VOC referenced as CH<sub>4</sub>. [District Rules 2201 and 4702]

Section 5.2.3.1 requires that the operator of a spark-ignited internal combustion engine rated > 50 bhp that is used exclusively in agricultural operations shall not operate it in such a manner that results in emissions exceeding the limits in Table 3 of Rule 4702 for the appropriate engine type on an engine-by-engine basis.

Section 5.2.3.2 allows that in lieu of complying with the NO<sub>x</sub>, CO, and VOC limits of Table 3 on an engine-by-engine basis, an operator of a spark-ignited agricultural IC engine may elect to implement an alternative emission control plan pursuant to Section 8.0.

Section 5.2.3.3 requires an operator of an agricultural IC engine in that is subject to the applicable requirements of Table 3 shall not replace such engine with an engine that emits more emissions of NO<sub>x</sub>, VOC, and CO, on a ppmv basis, (corrected to 15% oxygen on a dry basis) than the engine being replaced.

As stated above, the proposed digester gas-fired engines will be operated as part of a separate non-agricultural stationary source; therefore, Section 5.2.3 does not apply to the proposed engines.

Section 5.2.4 requires the operator of a certified compression-ignited engine rated >50 bhp shall comply with the following requirements of Sections 5.2.4.1, 5.2.4.2, 5.2.4.3, 5.2.4.3, and 5.2.4.4. The proposed digester gas-fired engines are not compression-ignited engines; therefore, Section 5.2.4 does not apply to the proposed engines.

Section 5.3 requires that all continuous emission monitoring systems (CEMS) emissions measurements shall be averaged over a period of 15 consecutive minutes. Any 15-consecutive minute block average CEMS measurement exceeding the applicable emission limits of this rule shall constitute a violation of this rule. The IC engines proposed under this project will not have CEMS installed; therefore this section of the Rule is not applicable.

Section 5.4 specifies procedures to calculate percent emission reductions if percent emission reductions are used to comply with the NO<sub>x</sub> emission limits of Section 5.2. The use of percent emission reductions to comply with Section 5.2 is not being proposed for the IC engines under this project; therefore this section of the Rule is not applicable.

Section 5.5 requires the operator of an internal combustion engine that uses percent emission reduction to comply with the NO<sub>x</sub> emission limits of Section 5.2 shall provide an accessible

inlet and outlet on the external control device or the engine as appropriate for taking emission samples and as approved by the APCO. The use of percent emission reductions to comply with Section 5.2 is not being proposed for the IC engines under this project; therefore this section of the Rule is not applicable.

Section 5.6 specifies procedures that operators of non-agricultural spark-ignited IC engines who elect to comply under Section 5.2.2.2 must use for calculation of the annual emissions fee. The applicant has proposed that the digester gas-fired engines comply with the applicable emission limits of Table 2 of District Rule 4702; therefore payment of annual emissions fees for the engines is not required and this section of the Rule is not applicable.

Section 5.7 requires that on and after the compliance schedule specified in Section 7.5, operators of non-agricultural spark-ignited engines and non-agricultural compression-ignited engines shall comply with Sections 5.7.1, 5.7.2, 5.7.3, 5.7.4, 5.7.5, or 5.7.6:

- 5.7.1 Operate the engine exclusively on PUC-quality natural gas, commercial propane, butane, or liquefied petroleum gas, or a combination of such gases; or
- 5.7.2 Limit gaseous fuel sulfur content to no more than five (5) grains of total sulfur per one hundred (100) standard cubic feet; or
- 5.7.3 Use California Reformulated Gasoline for gasoline-fired spark-ignited engines; or
- 5.7.4 Use California Reformulated Diesel for compression-ignited engines; or
- 5.7.5 Operate the engine on liquid fuel that contains no more than 15 ppm sulfur, as determined by the test method specified in Section 6.4.6; or
- 5.7.6 Install and properly operate an emission control system that reduces SO<sub>2</sub> emissions by at least 95% by weight as determined by the test method specified in Section 6.4.6.

To satisfy BACT, the average sulfur content of the digester gas fuel for the engine will be limited to 40 ppmv (approximately equal to 2.4 grains sulfur per 100 standard cubic feet). The following condition will be listed on the proposed engine ATC permits to ensure compliance:

- The sulfur content of the digester gas used as fuel in this engine shall not exceed 40 ppmv as H<sub>2</sub>S. The applicant may utilize an averaging period of up to 24 hours in length for demonstration of compliance with the fuel sulfur content limit. [District Rules 2201, 4702, and 4801]

Section 5.8 requires that the operator of a non-agricultural spark-ignited IC engine subject to the requirements of Section 5.2 or any engine subject to the requirements of Section 8.0 shall comply with the following requirements of Sections 5.8.1 – 5.8.11:

Section 5.8.1 stipulates that for each engine with a rated brake horsepower of 1,000 hp or greater and which is allowed to operate more than 2,000 hours per calendar year, or with an external emission control device, shall either install, operate, and maintain continuous monitoring equipment for NO<sub>x</sub>, CO, and oxygen, as identified in Rule 1080 (Stack Monitoring), or install, operate, and maintain APCO-approved alternate monitoring. The monitoring system may be a continuous emissions monitoring system (CEMS), a parametric emissions monitoring system (PEMS), or an alternative monitoring system approved by the APCO. APCO-approved alternate monitoring shall consist of one or more of the following:

- 5.8.1.1 Periodic NO<sub>x</sub> and CO emission concentrations,
- 5.8.1.2 Engine exhaust oxygen concentration,

- 5.8.1.3 Air-to-fuel ratio,
- 5.8.1.4 Flow rate of reducing agents added to engine exhaust,
- 5.8.1.5 Catalyst inlet and exhaust temperature,
- 5.8.1.6 Catalyst inlet and exhaust oxygen concentration, or
- 5.8.1.7 Other operational characteristics.

The applicant has proposed to comply with this section of the Rule by proposing a pre-approved alternate emissions monitoring plan that specifies that the permittee perform periodic NO<sub>x</sub>, CO, and O<sub>2</sub> emissions concentrations as specified in District Policy SSP-1810, dated 4/29/04. Therefore, the following condition will be placed on the engine ATC permits:

- The permittee shall monitor and record the stack concentration of NO<sub>x</sub>, CO, and O<sub>2</sub> at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack monitors may be allowed if they satisfy the standards for portable analyzers as specified in District policies and are approved in writing by the APCO.] Monitoring shall be performed not less than once every month for 12 months if two consecutive deviations are observed during quarterly monitoring. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the engine unless monitoring has been performed within the last month if on a monthly monitoring schedule, or within the last quarter if on a quarterly monitoring schedule. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 2201 and 4702]

Section 5.8.2 requires that for each non-agricultural spark-ignited IC engine not subject to Section 5.8.1, the operator shall monitor operational characteristics recommended by the engine manufacturer or emission control system supplier, and approved by the APCO. The proposed engines will be subject to Section 5.8.1; therefore this section is not applicable.

Section 5.8.3 requires that for each engine with an alternative monitoring system, the operator shall submit to, and receive approval from the APCO, adequate verification of the alternative monitoring system's acceptability. The proposed ATC permits for the digester gas-fired engines include a pre-approved alternate emissions monitoring plan that specifies that the permittee perform periodic NO<sub>x</sub>, CO, and O<sub>2</sub> emissions concentrations as specified in District Policy SSP-1810, dated 4/29/04. Therefore, this section is satisfied.

Section 5.8.4 requires that for each engine with an APCO approved CEMS, operate the CEMS in compliance with the requirements of 40 Code of Federal Regulations (CFR) Part 51, 40 CFR Parts 60.7 and 60.13 (except subsection h), 40 CFR Appendix B (Performance Specifications), 40 CFR Appendix F (Quality Assurance Procedures), and applicable provisions of Rule 1080 (Stack Monitoring). The IC engines proposed under this project will not have CEMS installed; therefore this section of the Rule is not applicable.

Section 5.8.5 requires that each engine have the data gathering and retrieval capabilities of an installed monitoring system described in Section 5.8 approved by the APCO. As stated above, the proposed ATC permits for the proposed digester gas-fired engines include an alternate emissions monitoring plan that has been pre-approved by the APCO. Therefore, this section is satisfied.

Section 5.8.6 requires that for each non-agricultural spark-ignited IC engine, the operator shall install and operate a nonresettable elapsed operating time meter. In lieu of installing a nonresettable time meter, the operator may use an alternative device, method, or technique in determining operating time provided that the alternative is approved by the APCO. The operator shall maintain and operate the required meter in accordance with the manufacturer's instructions. The applicant has proposed a nonresettable elapsed operating time meter for the engines in this project. Therefore, the following condition will be placed on the engine ATC permits to ensure compliance:

- This engine shall be equipped with an operational non-resettable elapsed time meter. [District Rules 2201 and 4702]

Section 5.8.7 requires that for each engine, the permittee shall implement the Inspection and Monitoring (I&M) plan submitted to and approved by the APCO pursuant to Section 6.5. The applicant has submitted an I&M program with this ATC application and the requirements of this plan will be explained in detail in the section that covers Section 6.5 of this Rule.

Section 5.8.8 requires that for each engine, collect data through the I&M plan in a form approved by the APCO. The applicant has submitted an I&M program and the requirements of this plan will be explained in detail in the section that covers Section 6.5 of this Rule.

Section 5.8.9 requires for each non-agricultural spark-ignited IC engine, use of a portable NO<sub>x</sub> analyzer to take NO<sub>x</sub> emission readings to verify compliance with the emission requirements of Section 5.2 or Section 8.0 during each calendar quarter in which a source test is not performed. If an engine is operated less than 120 calendar days per calendar year, the operator shall take one NO<sub>x</sub> emission reading during the calendar year in which a source test is not performed and the engine is operated. All emission readings shall be taken with the engine operating either at conditions representative of normal operations or conditions specified in the Permit-to-Operate or Permit-Exempt Equipment Registration. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. All NO<sub>x</sub> emissions readings shall be reported to the APCO in a manner approved by the APCO. NO<sub>x</sub> emission readings taken pursuant to this section shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive minute sample reading or by taking at least five (5) readings evenly spaced out over the 15 consecutive-minute period. Therefore, the following conditions will be placed on the ATC permits:

- The permittee shall monitor and record the stack concentration of NO<sub>x</sub>, CO, and O<sub>2</sub> at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack monitors may be allowed if they satisfy the standards for portable analyzers as specified in District policies and are approved in writing by the APCO.] Monitoring shall be performed not less than once every month for 12 months if two consecutive deviations are observed during quarterly monitoring. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the engine unless monitoring has been performed within the last month if on a monthly monitoring schedule, or within the last quarter if on a quarterly monitoring schedule. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 2201 and 4702]

- {3787} All alternate monitoring parameter emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rule 4702]

Section 5.8.10 specifies that the APCO shall not approve an alternative monitoring system unless it is documented that continued operation within ranges of specified emissions related performance indicators or operational characteristics provides a reasonable assurance of compliance with applicable emission limits and that the operator shall source test over the proposed range of surrogate operating parameters to demonstrate compliance with the applicable emission standards. The proposed ATC permits for the digester gas-fired engines include a pre-approved alternate emissions monitoring plan that requires periodic NO<sub>x</sub>, CO, and O<sub>2</sub> emissions concentrations. Therefore, this section is satisfied.

Section 5.8.11 requires that for each non-agricultural spark-ignited IC engine subject to the Alternate Emission Control Plan (AECPP) of Section 8.0, the operator shall install and operate a nonresettable fuel meter. In lieu of installing a nonresettable fuel meter, the operator may use an alternative device, method, or technique in determining daily fuel consumption provided that the alternative is approved by the APCO. The operator shall maintain, operate, and calibrate the required fuel meter in accordance with the manufacturer's instructions. The use of an Alternate Emission Control Plan to comply with Section 5.2 is not being proposed for the IC engines under this project; therefore this section of the Rule is not applicable.

Section 5.9 specifies monitoring requirements for all other engines that are not subject to the requirements of Section 5.8. The proposed spark-ignited non-agricultural digester gas-fired engines are subject to the requirements of Section 5.8; therefore this section of the Rule is not applicable.

Section 5.10 specifies SO<sub>x</sub> Emissions Monitoring Requirements. On and after the compliance schedule specified in Section 7.5, an operator of a non-agricultural IC engine shall comply with the following requirements:

- 5.10.1 An operator of an engine complying with Sections 5.7.2 or 5.7.5 shall perform an annual sulfur fuel analysis in accordance with the test methods in Section 6.4. The operator shall keep the records of the fuel analysis and shall provide it to the District upon request,
- 5.10.2 An operator of an engine complying with Section 5.7.6 by installing and operating a control device with at least 95% by weight SO<sub>x</sub> reduction efficiency shall submit for approval by the APCO the proposed the key system operating parameters and frequency of the monitoring and recording not later than July 1, 2013, and
- 5.10.3 An operator of an engine complying with Section 5.7.6 shall perform an annual source test unless a more frequent sampling and reporting period is included in the Permit-to-Operate. Source tests shall be performed in accordance with the test methods in Section 6.4.

The following condition will be listed on the proposed ATC permits to ensure compliance:

- Fuel sulfur content analysis shall be performed at least annually using EPA Method 11 or EPA Method 15, as appropriate. Records of the fuel sulfur analysis shall be maintained and provided to the District upon request. [District Rules 2201 and 4702]

Section 5.11 requires operators of engines used exclusively in agricultural operations that are not required to have a Permit-to-Operate pursuant to California Health and Safety Code Section 42301.16 but are required to comply with Section 5.2 of Rule 4702 shall register such engines pursuant to Rule 2250 (Permit-Exempt Equipment Registration). The proposed spark-ignited non-agricultural digester gas-fired engines are required to have a District Permit to Operate; therefore this section of the Rule is not applicable.

Section 6.1 requires that the operator of an engine subject to the requirements of Rule 4702 shall submit to the APCO an approvable emission control plan of all actions to be taken to satisfy the emission requirements of Section 5.2 and the compliance schedules of Section 7.0. If there is no change to the previously-approved emission control plan, the operator shall submit a letter to the District indicating that the previously approved plan is still valid.

Section 6.1.1 specifies that the requirement to submit an emission control plan shall apply to the following engines:

- 6.1.1.1 Engines that have been retrofitted with an exhaust control device, except those certified per Section 9.0;
- 6.1.1.2 Engines subject to Section 8.0;
- 6.1.1.3 An agricultural spark-ignited engine that is subject to the requirements of Section 8.0;
- 6.1.1.4 An agricultural spark-ignited engine that has been retrofitted with a catalytic emission control and is not subject to the requirements of Section 8.0

Section 6.1.2 specifies that the emission control plan shall contain the following information, as applicable for each engine:

- 6.1.2.1 Permit-to-Operate number, Authority-to-Construct number, or Permit-Exempt Equipment Registration number,
- 6.1.2.2 Engine manufacturer,
- 6.1.2.3 Model designation and engine serial number,
- 6.1.2.4 Rated brake horsepower,
- 6.1.2.5 Type of fuel and type of ignition,
- 6.1.2.6 Combustion type: rich-burn or lean-burn,
- 6.1.2.7 Total hours of operation in the previous one-year period, including typical daily operating schedule,
- 6.1.2.8 Fuel consumption (cubic feet for gas or gallons for liquid) for the previous one-year period,
- 6.1.2.9 Stack modifications to facilitate continuous in-stack monitoring and to facilitate source testing,
- 6.1.2.10 Type of control to be applied, including in-stack monitoring specifications,
- 6.1.2.11 Applicable emission limits,
- 6.1.2.12 Documentation showing existing emissions of NO<sub>x</sub>, VOC, and CO, and
- 6.1.2.13 Date that the engine will be in full compliance with this rule.

Section 6.1.3 requires that the emission control plan shall identify the type of emission control device or technique to be applied to each engine and a construction/removal schedule, or shall provide support documentation sufficient to demonstrate that the engine is in compliance with the emission requirements of this rule.

Section 6.1.4 requires that for an engine being permanently removed from service, the emission control plan shall include a letter of intent pursuant to Section 7.2.

The applicant has submitted all the required information for Section 6.1 in the application for the IC engines evaluated under this project.

Section 6.2.1 requires that the operator of an engine subject to the requirements of Section 5.2 shall maintain an engine operating log to demonstrate compliance with Rule 4702. This information shall be retained for a period of at least five years, shall be readily available, and be made available to the APCO upon request. The engine operating log shall include, on a monthly basis, the following information:

- 6.2.1.1 Total hours of operation,
- 6.2.1.2 Type of fuel used,
- 6.2.1.3 Maintenance or modifications performed,
- 6.2.1.4 Monitoring data,
- 6.2.1.5 Compliance source test results, and
- 6.2.1.6 Any other information necessary to demonstrate compliance with this rule.
- 6.2.1.7 For an engine subject to Section 8.0, the quantity (cubic feet of gas or gallons of liquid) of fuel used on a daily basis.

The following condition will be placed on the ATC permits:

- The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: the total hours of operation, the type and quantity of fuel used, maintenance and modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. Quantity of fuel used shall be recorded in standard cubic feet using a non-resettable, totalizing mass or volumetric fuel flow meter or other APCO approved-device. [District Rules 2201 and 4702]

Section 6.2.2 requires that the data collected pursuant to the requirements of Section 5.8 and Section 5.9 shall be maintained for at least five years, shall be readily available, and made available to the APCO upon request.

The following previously presented condition will be listed on the proposed ATC permits to ensure compliance:

- All records shall be maintained and retained for a minimum of five (5) years, and shall be made available for District inspection upon request. All records may be maintained and submitted in an electronic format approved by the District. [District Rules 2201 and 4702]

Section 6.2.3 requires that an operator claiming an exemption under Section 4.2 or Section 4.3 shall maintain annual operating records. This information shall be retained for at least five



years, shall be readily available, and provided to the APCO upon request. The records shall include, but are not limited to, the following:

- 6.2.3.1 Total hours of operation,
- 6.2.3.2 The type of fuel used,
- 6.2.3.3 The purpose for operating the engine,
- 6.2.3.4 For emergency standby engines, all hours of non-emergency and emergency operation shall be reported, and
- 6.2.3.5 Other support documentation necessary to demonstrate claim to the exemption

The applicant is not claiming an exemption for the proposed engines under Section 4.2 or Section 4.3; therefore, this section does not apply.

Section 6.3 requires that the operator of an engine subject to the emission limits in Section 5.2 or the requirements of Section 8.2, shall comply with the compliance testing requirements of Section 6.3.

Section 6.3.1 specifies that the requirements of Section 6.3.2 through Section 6.3.4 shall apply to the following engines:

- 6.3.1.1 Engines that have been retrofitted with an exhaust control device, except those certified per Section 9.0;
- 6.3.1.2 Engines subject to Section 8.0;
- 6.3.1.3 An agricultural spark-ignited engine that is subject to the requirements of Section 8.0;
- 6.3.1.4 An agricultural spark-ignited engine that has been retrofitted with a catalytic emission control and is not subject to the requirements of Section 8.0

Section 6.3.2 requires demonstration of compliance with applicable limits, ppmv or percent reduction, in accordance with the test methods in Section 6.4, as specified below:

- 6.3.2.1 By the applicable date specified in Section 5.2, and at least once every 24 months thereafter, except for an engine subject to Section 6.3.2.2.
- 6.3.2.2 By the applicable date specified in Section 5.2 and at least once every 60 months thereafter, for an agricultural spark-ignited engine that has been retro-fitted with a catalytic emission control device.
- 6.3.2.3 A portable NO<sub>x</sub> analyzer may be used to show initial compliance with the applicable limits/standards in Section 5.2 for agricultural spark-ignited engines, provided the criteria specified in Sections 6.3.2.3.1 to 6.3.2.3.5 are met, and a source test is conducted in accordance with Section 6.3.2 within 12 months from the required compliance date.

The following conditions will be included the ATC permits to ensure compliance:

- Source testing to measure NO<sub>x</sub>, CO, VOC, PM<sub>10</sub>, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted within 90 days of initial start-up. [District Rules 1081, 2201, and 4702]
- Source testing to measure NO<sub>x</sub>, CO, VOC, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted at least once every 24 months. [District Rules 1081, 2201, and 4702]

Section 6.3.3 requires the operator to conduct emissions source testing with the engine operating either at conditions representative of normal operations or conditions specified in the

Permit-to-Operate or Permit-Exempt Equipment Registration. For emissions source testing performed pursuant to Section 6.3.2 for the purpose of determining compliance with an applicable standard or numerical limitation, the arithmetic average of three (3) 30-consecutive-minute test runs shall apply. If two (2) of three (3) runs are above an applicable limit, the test cannot be used to demonstrate compliance with an applicable limit. VOC shall be reported as methane. VOC, NO<sub>x</sub>, and CO concentrations shall be reported in ppmv, corrected to 15 percent oxygen. For engines that comply with a percent reduction limit, the percent reduction of NO<sub>x</sub> emissions shall also be reported.

The following conditions will be included in the ATC permits to ensure compliance:

- {3791} Emissions source testing shall be conducted with the engine operating either at conditions representative of normal operations or conditions specified in the Permit to Operate. [District Rule 4702]
- For emissions source testing, the arithmetic average of three 30-consecutive-minute test runs shall apply. If two of three runs are above an applicable limit, the test cannot be used to demonstrate compliance with an applicable limit. VOC emissions shall be reported as methane. NO<sub>x</sub>, CO, VOC, and NH<sub>3</sub> concentrations shall be reported in ppmv, corrected to 15% oxygen. [District Rules 2201 and 4702]

Section 6.3.4 requires that in addition to other information, the source test protocol shall describe which critical parameters will be measured and how the appropriate range for these parameters shall be established. The range for these parameters shall be incorporated into the I&M plan.

Section 6.3.5 specifies that engines that are limited by Permit-to-Operate or Permit-Exempt Equipment Registration condition to be fueled exclusively with PUC quality natural gas shall not be subject to the reoccurring source test requirements of Section 6.3.2 for VOC emissions. The proposed engines will be fueled on digester gas; therefore this section does not apply.

Section 6.3.6 specifies requirements for spark-ignited engines for testing a unit or units that represent a specified group of units, in lieu of compliance with the applicable requirements of Section 6.3.2. Testing of representative units is not being proposed for the engines; therefore this section does not apply.

Section 6.4 requires that the compliance with the requirements of Section 5.2 shall be determined, as required, in accordance with the following test procedures or any other method approved by EPA and the APCO:

- 6.4.1 Oxides of nitrogen - EPA Method 7E, or ARB Method 100.
- 6.4.2 Carbon monoxide - EPA Method 10, or ARB Method 100.
- 6.4.3 Stack gas oxygen - EPA Method 3 or 3A, or ARB Method 100.
- 6.4.4 Volatile organic compounds - EPA Method 25A or 25B, or ARB Method 100. Methane and ethane, which are exempt compounds, shall be excluded from the result of the test.
- 6.4.5 Operating horsepower determination - any method approved by EPA and the APCO.
- 6.4.6 SO<sub>x</sub> Test Methods
  - 6.4.6.1 Oxides of sulfur – EPA Method 6C, EPA Method 8, or ARB Method 100.

- 6.4.6.2 Determination of total sulfur as hydrogen sulfide (H<sub>2</sub>S) content – EPA Method 11 or EPA Method 15, as appropriate.
- 6.4.6.3 Sulfur content of liquid fuel – American Society for Testing and Materials (ASTM) D 6920-03 or ASTM D 5453-99.
- 6.4.6.4 The SO<sub>x</sub> emission control system efficiency shall be determined using the following:  
% Control Efficiency =  $[(C_{SO_2, \text{inlet}} - C_{SO_2, \text{outlet}}) / C_{SO_2, \text{inlet}}] \times 100$   
Where:  
C<sub>SO<sub>2</sub>, inlet</sub> = concentration of SO<sub>x</sub> (expressed as SO<sub>2</sub>) at the inlet side of the SO<sub>x</sub> emission control system, in lb/Dscf  
C<sub>SO<sub>2</sub>, outlet</sub> = concentration of SO<sub>x</sub> (expressed as SO<sub>2</sub>) at the outlet side of the SO<sub>x</sub> emission control system, in lb/Dscf
- 6.4.7 The Higher Heating Value (hhv) of the fuel shall be determined by one of the following test methods:  
6.4.7.1 ASTM D 240-02 or ASTM D 3282-88 for liquid hydrocarbon fuels.  
6.4.7.2 ASTM D 1826-94 or ASTM 1945-96 in conjunction with ASTM D 3588-89 for gaseous fuel.

The following conditions will be listed on the proposed ATC permits to ensure compliance:

- The following methods shall be used for source testing: NO<sub>x</sub> (ppmv) - EPA Method 7E or ARB Method 100; CO (ppmv) - EPA Method 10 or ARB Method 100; VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100; stack gas oxygen - EPA Method 3 or 3A or ARB Method 100; stack gas velocity - EPA Method 2 or EPA Method 19; stack gas moisture content - EPA Method 4; PM<sub>10</sub> (filterable and condensable) - EPA Method 201 and 202, EPA Method 201a and 202, or ARB Method 5 in combination with Method 501; NH<sub>3</sub> - BAAQMD ST-1B or SCAQMD Method 207-1. Alternative test methods as approved by the District may also be used to address the source testing requirements of this permit. [District Rules 1081 and 4702]
- Fuel sulfur content analysis shall be performed at least annually using EPA Method 11 or EPA Method 15, as appropriate. Records of the fuel sulfur analysis shall be maintained and provided to the District upon request. [District Rules 2201 and 4702]
- The Higher Heating Value (HHV) of the fuel gas shall be determined using ASTM D1826, ASTM 1945 in conjunction with ASTM D3588, or an alternative method approved by the District. [District Rules 2201 and 4702]

Section 6.5 requires that the operator of an engine that is subject to the requirements of Section 5.2 or the requirements of Section 8.0 shall submit to the APCO for approval, an Inspection & Maintenance (I&M) plan that specifies all actions to be taken to satisfy the requirements of Sections 6.5.1 through Section 6.5.9 and the requirements of Section 5.8. The actions to be identified in the I&M plan shall include, but are not limited to, the information specified below. If there is no change to the previously approved I&M plan, the operator shall submit a letter to the District indicating that previously approved plan is still valid.

Section 6.5.1 specifies that the I&M plan requirements of Sections 6.5.2 through Section 6.5.9 shall apply to the following engines:

- 6.5.1.1 Engines that have been retrofitted with an exhaust control device, except those certified per Section 9.0;
- 6.5.1.2 Engines subject to Section 8.0;

- 6.5.1.3 An agricultural spark-ignited engine that is subject to the requirements of Section 8.0.
- 6.5.1.4 An agricultural spark-ignited engine that has been retrofitted with a catalytic emission control and is not subject to the requirements of Section 8.0

The digester gas-fired IC engines evaluated under this project will be equipped with SCR systems for control of NO<sub>x</sub> and oxidation catalysts for control of CO and VOC. Therefore, the requirements of Sections 6.5.2 through 6.5.9 are applicable to the engines.

Section 6.5.2 requires procedures requiring the operator to establish ranges for control equipment parameters, engine operating parameters, and engine exhaust oxygen concentrations that source testing has shown result in pollutant concentrations within the rule limits.

Section 6.5.3 requires procedures for monthly inspections as approved by the APCO. The applicable control equipment parameters and engine operating parameters will be inspected and monitored monthly in conformance with a regular inspection schedule in the I&M plan.

The digester gas-fired IC engines evaluated under this project will be equipped with SCR systems for control of NO<sub>x</sub> and oxidation catalysts for control of CO and VOC. The applicant has proposed the following alternate monitoring program to ensure compliance with Sections 6.5.2 and 6.5.3 of the Rule.

#### NO<sub>x</sub> Emissions:

In order to satisfy the I & M requirements for NO<sub>x</sub> emissions, the applicant has proposed to perform the following:

1. Measurement of NO<sub>x</sub> emissions concentrations with a portable analyzer at least once every calendar quarter.
2. To ensure that NO<sub>x</sub> emissions concentrations are not being exceeded between periodic NO<sub>x</sub> portable analyzer measurements, the applicant is proposing to determine a correlation between the SCR system's reagent injection rate and the catalyst control system inlet exhaust temperature and NO<sub>x</sub> emissions. The appropriate ranges for each operating load will be established during performance testing and will be monitored at least once per month.

#### CO and VOC Emissions:

In order to satisfy the I & M requirements for CO and VOC emissions, the applicant has proposed to perform the following:

1. Measurement of CO emissions concentrations with a portable analyzer at least once every calendar quarter. Generally, if the oxidation catalyst is controlling CO emissions, it should also be achieving the desired removal efficiency for VOC emissions. Therefore, no additional monitoring for VOC emissions is required.

2. To ensure that CO and VOC emissions concentrations are not being exceeded between periodic CO emissions concentration measurements, the applicant is proposing to determine a correlation between the catalyst control system inlet exhaust temperature and back pressure and CO emissions. The appropriate ranges for each operating load will be established during performance testing and will be monitored at least once per month.

Therefore, the following conditions will be listed on the proposed ATC permits to ensure compliance with the I & M requirements for NO<sub>x</sub>, CO, and VOC:

- Within 90 days of initial start-up, the SCR system reagent injection rate and inlet temperature to the catalyst control system shall be monitored to establish acceptable values and ranges that provide a reasonable assurance of ongoing compliance with the NO<sub>x</sub> emissions limit(s) stated in this permit. Acceptable values and ranges shall be established for each load that the engine is expected to operate at, in a minimum of 10% increments (e.g. 70%, 80%, and 90%). Records of the acceptable SCR system reagent injection rate(s) and inlet temperature(s) to the catalyst control system demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) shall be maintained and made available for inspection upon request. [District Rule 4702]
- If the SCR system reagent injection rate and/or the inlet temperature to the catalyst control system is outside of the established acceptable range(s), the permittee shall return the SCR system reagent injection rate and inlet temperature to the catalyst control system to within the established acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the SCR system reagent injection rate and inlet temperature to the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of NO<sub>x</sub> and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of NO<sub>x</sub> and O<sub>2</sub> shall continue until the operator can show that the SCR system reagent injection rate and inlet temperature to the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) of this permit. [District Rule 4702]
- Within 90 days of initial start-up, the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system shall be monitored to establish acceptable values and ranges that provide a reasonable assurance of ongoing compliance with the emissions limit(s) stated in this permit. Acceptable values and ranges shall be established for each load that the engine is expected to operate at, in a minimum of 10% increments (e.g. 70%, 80%, and 90%). Records of the established acceptable inlet temperature(s) and back pressure(s) demonstrated to result in compliance with the CO and VOC emission limits shall be maintained and made available for inspection upon request. [District Rule 4702]
- If the inlet temperature to the catalyst control system and/or the back pressure of the exhaust upstream of the catalyst control system is outside of the established acceptable range(s), the permittee shall return the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system back to the acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are not returned to within acceptable range(s)

within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of CO and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of CO and O<sub>2</sub> shall continue until the operator can show that the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the CO emission limit(s) of this permit. [District Rule 4702]

- The permittee shall monitor and record the engine operating load, the SCR system reagent injection rate, the inlet temperature to the catalyst control system, and the back pressure of the exhaust upstream of the catalyst control system at least once per month. [District Rule 4702]

Section 6.5.4 requires procedures for the corrective actions on the noncompliant parameter(s) that the operator will take when an engine is found to be operating outside the acceptable range for control equipment parameters, engine operating parameters, and engine exhaust NO<sub>x</sub>, CO, VOC, or oxygen concentrations.

Section 6.5.5 requires procedures for the operator to notify the APCO when an engine is found to be operating outside the acceptable range for control equipment parameters, engine operating parameters, and engine exhaust NO<sub>x</sub>, CO, VOC, or oxygen concentrations.

The applicant has proposed that the alternate monitoring program will ensure compliance with these two sections of the Rule. Therefore, the following conditions will be listed on the proposed ATC permits to ensure compliance:

- If the NO<sub>x</sub>, CO, or NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, as measured by the portable analyzer or the District-approved ammonia monitoring equipment, exceed the respective permitted emissions concentration(s), the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 8 hours of operation after detection. If the portable analyzer or ammonia monitoring equipment readings continue to exceed the permitted emissions concentration(s) after 8 hours of operation after detection, the permittee shall notify the District within the following 1 hour and conduct a certified source test within 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of the performing the notification and testing required by this condition. [District Rules 2201 and 4702]
- If the SCR system reagent injection rate and/or the inlet temperature to the catalyst control system is outside of the established acceptable range(s), the permittee shall return the SCR system reagent injection rate and inlet temperature to the catalyst control system to within the established acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the SCR system reagent injection rate and inlet temperature to the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of NO<sub>x</sub> and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of NO<sub>x</sub> and O<sub>2</sub> shall continue until the operator can show that the SCR system reagent injection rate and inlet temperature to the catalyst control

system are operating within the acceptable range(s) demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) of this permit. [District Rule 4702]

- If the inlet temperature to the catalyst control system and/or the back pressure of the exhaust upstream of the catalyst control system is outside of the established acceptable range(s), the permittee shall return the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system back to the acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of CO and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of CO and O<sub>2</sub> shall continue until the operator can show that the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the CO emission limit(s) of this permit. [District Rule 4702]

Section 6.5.6 requires procedures for and corrective maintenance performed for the purpose of maintaining an engine in proper operating condition. The applicant has proposed that the engines will be operated and maintained per the specifications of the manufacturer or emissions control system supplier. Therefore, the following conditions will be listed on the proposed ATC permits:

- {4261} This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702]
- {3203} This engine shall be operated within the ranges that the source testing has shown result in pollution concentrations within the emissions limits as specified on this permit. [District Rule 4702]

Section 6.5.7 requires procedures and a schedule for using a portable NO<sub>x</sub> analyzer to take NO<sub>x</sub> emission readings pursuant to Section 5.8.9. The applicant has proposed that the alternate monitoring program will ensure compliance with this section of the Rule. The following previously proposed condition will be listed on the proposed ATC permits:

- {3787} All alternate monitoring parameter emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rule 4702]

Section 6.5.8 requires procedures for collecting and recording required data and other information in a form approved by the APCO including, but not limited to, data collected through the I&M plan and the monitoring systems described in Sections 5.8.1 and 5.8.2. Data collected through the I&M plan shall have retrieval capabilities as approved by the APCO. The

applicant has proposed that the alternate monitoring program will ensure compliance with this section of the Rule.

The following condition will be listed on the proposed ATC permits to ensure compliance:

- The permittee shall maintain records of: (1) the date and time of NO<sub>x</sub>, CO, O<sub>2</sub>, and NH<sub>3</sub> measurements, (2) the O<sub>2</sub> concentration in percent and the measured NO<sub>x</sub>, CO, and NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, (5) the method of determining the NH<sub>3</sub> emission concentration, and (6) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 2201 and 4702]

Section 6.5.9 specifies procedures for revising the I&M plan. The I&M plan shall be updated to reflect any change in operation. The I&M plan shall be updated prior to any planned change in operation. An engine operator that changes significant I&M plan elements must notify the District no later than seven days after the change and must submit an updated I&M plan to the APCO no later than 14 days after the change for approval. The date and time of the change to the I&M plan shall be recorded in the engine operating log. For new engines and modifications to existing engines, the I&M plan shall be submitted to and approved by the APCO prior to issuance of the Permit-to-Operate or Permit-Exempt Equipment Registration. The operator of an engine may request a change to the I&M plan at any time.

The applicant has proposed to comply with the I&M plan modification requirements per this section of the Rule. The following condition will be listed on the proposed ATC permits to ensure compliance:

- {3212} The permittee shall update the I&M plan for this engine prior to any planned change in operation. The permittee must notify the District no later than seven days after changing the I&M plan and must submit an updated I&M plan to the APCO for approval no later than 14 days after the change. The date and time of the change to the I&M plan shall be recorded in the engine's operating log. For modifications, the revised I&M plan shall be submitted to and approved by the APCO prior to issuance of the Permit to Operate. The permittee may request a change to the I&M plan at any time. [District Rule 4702]

Section 7.0 specifies the schedules for compliance with the general requirements of Section 5.0 and the Alternative Emission Control Plan (AECPP) option of Section 8.0. The proposed IC engines will be required to comply with the applicable sections of District Rule 4702 upon initial startup of the equipment; therefore, compliance with this section is expected.

Section 8.0 specifies requirements for use of an Alternative Emission Control Plan (AECPP) to comply with the NO<sub>x</sub> emission requirements of Section 5.2 for a group of engines. Requirements for use of an AECPP include: only engines subject to Section 5.2 are eligible for inclusion in an AECPP; during any seven consecutive day period, the operator shall operate all engines in the AECPP to achieve an actual aggregate NO<sub>x</sub> emission level that is ≤ 90% of the NO<sub>x</sub> emissions that would be obtained by controlling the engines to comply individually with the NO<sub>x</sub> limits in Section 5.2; the operator shall establish a NO<sub>x</sub> emission factor limit for each engine; the operator must submit the AECPP at least 18 months before compliance with the emission limits in Section 5.2 is required and receive approval from the APCO; the operator must submit and updated or modified AECPP for approval by the APCO prior to any



modifications; and the operator must maintain records necessary to demonstrate compliance with AECF. The use of an Alternate Emission Control Plan to comply with Section 5.2 is not being proposed for the IC engines proposed under this project; therefore this section of the Rule is not applicable.

Section 9.0 specifies requirements for certification of exhaust control systems for compliance with District Rule 4702. Certification under this section for the exhaust control systems for the IC engines under this project is not currently being proposed and, in addition, certification under this section of the Rule would require that the engines or identical units with the same fuel supply and exhaust control systems were operating and could be source tested to demonstrate compliance with the applicable limits; therefore this section of the Rule is not applicable.

### Conclusion

As shown above, the proposed non-agricultural, digester gas-fired, lean burn, IC engines are expected to comply with the applicable requirements of Rule 4702 upon initial operation and no further discussion is required.

### **Rule 4801 Sulfur Compounds**

The purpose of this District Rule 4801 is to limit the emissions of sulfur compounds. The limit is that sulfur compound emissions (as SO<sub>2</sub>) shall not exceed 0.2% by volume. Using the ideal gas equation, the sulfur compound emissions are calculated as follows:

$$\text{Volume of SO}_x \text{ as (SO}_2\text{)} = (n \times R \times T) \div P$$

Where:

$$n = \text{moles SO}_x$$

$$T \text{ (standard temperature)} = 60 \text{ }^\circ\text{F or } 520 \text{ }^\circ\text{R}$$

$$R \text{ (universal gas constant)} = \frac{10.73 \text{ psi} \cdot \text{ft}^3}{\text{lb} \cdot \text{mol} \cdot \text{ }^\circ\text{R}}$$

$$0.0113 \frac{\text{lb}}{\text{MMBtu}} \times \frac{1 \text{ MMBtu}}{9,100 \text{ scf}_{\text{exhaust}}} \times \frac{1 \text{ lb} \cdot \text{mol}}{64 \text{ lb} \cdot \text{SO}_2} \times \frac{10.73 \text{ psi} \cdot \text{ft}^3}{\text{lb} \cdot \text{mol} \cdot \text{ }^\circ\text{R}} \times \frac{520 \text{ }^\circ\text{R}}{14.7 \text{ psi}} \times 1,000,000 \text{ ppm} = 7.4 \text{ ppmv}$$

Since 7.4 ppmv is  $\leq$  2000 ppmv, the engines are expected to comply with Rule 4801. The following condition will be placed on the engine ATC permits to ensure compliance:

- The sulfur content of the digester gas used as fuel in this engine shall not exceed 40 ppmv as H<sub>2</sub>S. The applicant may utilize an averaging period of up to 24 hours in length for demonstration of compliance with the fuel sulfur content limit. [District Rules 2201, 4102, 4702, and 4801]

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

This rule incorporates the New Source Performance Standards (NSPS) from Part 60, Chapter 1, Title 40, Code of Federal Regulations (CFR); and applies to all new sources of air pollution and modifications of existing sources of air pollution listed in 40 CFR Part 60.

The purpose of 40 CFR 60 Subpart JJJJ is to establish New Source Performance Standards to reduce emissions of NO<sub>x</sub>, SO<sub>x</sub>, PM, CO, and VOC from new stationary spark ignition (SI) internal combustion (IC) engines.

Pursuant to Section 60.4230, compliance with this subpart is required for owners and operators of stationary SI IC engines that commence construction after June 12, 2006, where the stationary SI ICE are manufactured: (a) on or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 HP (except lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP); (b) on or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP; (c) on or after July 1, 2008, for engines with a maximum engine power less than 500 HP; or (d) on or after January 1, 2009, for emergency engines with a maximum engine power greater than 19 KW (25 HP).

The proposed engines are 1,468 bhp SI ICEs that will be constructed after June 12, 2006 and manufactured after July 1, 2007; therefore, the engines are subject to this subpart. However, the District has not been delegated the authority to implement 40 CFR 60, Subpart JJJJ for non-Major Sources; therefore, the requirements from this subpart will not be included in the ATC permits. However, the applicant will be responsible for compliance with the applicable requirements of this regulation.

#### **40 CFR 63 Subpart ZZZZ National Emission Standards for Hazardous Air Pollutants for Stationary Internal Combustion Engines**

40 CFR 63 Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAPs) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. A major source of HAP emissions is a facility that has the potential to emit any single HAP at a rate of 10 tons/year or greater or any combinations of HAPs at a rate of 25 tons/year or greater. An area source of HAPs is a facility is not a major source of HAPs.

Pursuant to Section 63.6590(c), an affected source that is a new or reconstructed stationary Reciprocating Internal Combustion Engine (RICE) located at an area source must meet the requirements of 40 CFR 63, Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart IIII, for compression ignition engines or 40 CFR 60, Subpart JJJJ, for spark ignition engines and no further requirements apply for such engines under this part. As with 40 CFR 60, Subpart JJJJ, the District has not been delegated the authority to implement 40 CFR 63, Subpart ZZZ for non-Major Sources; therefore, no requirements from this subpart will be included in the ATC permits. However, the applicant will be responsible for compliance with the applicable requirements of this regulation.

### **California Health & Safety Code 42301.6 (School Notice)**

The District has verified that this site is not located within 1,000 feet of a school. Therefore, pursuant to California Health and Safety Code 42301.6, a school notice is not required.

### **California Environmental Quality Act (CEQA)**

CEQA requires each public agency to adopt objectives, criteria, and specific procedures consistent with CEQA Statutes and the CEQA Guidelines for administering its responsibilities under CEQA, including the orderly evaluation of projects and preparation of environmental documents. The District adopted its *Environmental Review Guidelines* (ERG) in 2001. The basic purposes of CEQA are to:

- Inform governmental decision-makers and the public about the potential, significant environmental effects of proposed activities;
- Identify the ways that environmental damage can be avoided or significantly reduced;
- Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; and
- Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

### **Greenhouse Gas (GHG) Significance Determination**

It is determined that no other agency has or will prepare an environmental review document for the project. Thus the District is the Lead Agency for this project.

The proposed project is for construction of a renewable energy plant at an existing dairy facility. The proposed renewable energy plant will combust dairy digester gas in IC engines to produce electricity. The proposed project will involve diverting manure from existing open basin(s) and pond(s) at the dairy to covered lagoon digester(s), which will result in the capture of much of the methane that is currently released into the atmosphere from the open basins and pond at the dairy. Combustion of the dairy digester gas at the proposed renewable energy plant will oxidize the methane in the gas to carbon dioxide and water vapor. Because methane has a global warming potential at least 21 times that of carbon dioxide, combustion of the methane from the dairy digesters will result in a large net decrease in the global warming potential emitted from the dairy when compared to current levels. Therefore, the project will not result in an increase in project specific greenhouse gas emissions. The District therefore concludes that the project would have a less than cumulatively significant impact on global climate change.

### **District CEQA Findings**

The District is the Lead Agency for this project because there is no other agency with broader statutory authority over this project. The District performed an Engineering Evaluation (this document) for the proposed project and determined that, although the project is considered to take place at a separate stationary source for NSR purposes,

the activity will occur on previously developed land at an existing dairy facility and the project involves negligible expansion of the existing use. Furthermore, the District determined that the activity will not have a significant effect on the environment. The District finds that the activity is categorically exempt from the provisions of CEQA pursuant to CEQA Guideline § 15301 (Existing Facilities), and finds that the project is exempt per the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment (CEQA Guidelines §15061(b)(3)).

**IX. Recommendation**

Compliance with all applicable rules and regulations is expected. Pending a successful NSR Public Noticing period, issue ATCs S-8637-1-0, -2-0, and -3-0 subject to the permit conditions on the attached draft ATC in Appendix D.

**X. Billing Information**

<b>Annual Permit Fees</b>			
Permit Number	Fee Schedule	Fee Description	Annual Fee
S-8367-1-0	3020-06	Covered Lagoon Digester	\$1111.00
S-8367-2-0	3020-10-F	1,468 bhp IC engine	\$785.00
S-8367-3-0	3020-10-F	1,468 bhp IC engine	\$785.00

**Appendixes**

- A: Quarterly Net Emissions Change (QNEC)
- B: BACT Analysis for the Proposed Digester Gas-Fired IC Engines
- C: Summary of Health Risk Assessment (HRA) and Ambient Air Quality Analysis (AAQA)
- D: Draft ATCs (S-8367-1-0, -2-0, & -3-0)

**APPENDIX A**  
**Quarterly Net Emissions Change (QNEC)**

**Quarterly Net Emissions Change (QNEC)**

The Quarterly Net Emissions Change is used to complete the emission profile screen for the District's PAS database. The QNEC shall be calculated as follows:

QNEC = PE2 - PE1, where:

- QNEC = Quarterly Net Emissions Change for each emissions unit, lb/qtr.
- PE2 = Post Project Potential to Emit for each emissions unit, lb/qtr.
- PE1 = Pre-Project Potential to Emit for each emissions unit, lb/qtr.

Using the values in Sections VII.C.2 and VII.C.1 in the evaluation above, quarterly PE2 and quarterly PE1 can be calculated as follows:

S-8637-1-0 (Digester System)

<b>PE1 (lb/qtr) S-8637-1-0</b>					
	PE1 (lb/year)	÷	4 qtr/year	=	PE1 (lb/qtr)
NO <sub>x</sub>	0	÷	4 qtr/year	=	0.0
SO <sub>x</sub>	0	÷	4 qtr/year	=	0.0
PM <sub>10</sub>	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0

<b>PE2 (lb/qtr) S-8637-1-0</b>					
	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO <sub>x</sub>	0	÷	4 qtr/year	=	0.0
SO <sub>x</sub>	0	÷	4 qtr/year	=	0.0
PM <sub>10</sub>	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0

<b>Quarterly NEC [QNEC] S-8637-1-0</b>					
	PE2 (lb/qtr)	-	PE1 (lb/qtr)	=	NEC (lb/qtr)
NO <sub>x</sub>	0.0	-	0.0	=	0.0
SO <sub>x</sub>	0.0	-	0.0	=	0.0
PM <sub>10</sub>	0.0	-	0.0	=	0.0
CO	0.0	-	0.0	=	0.0
VOC	0.0	-	0.0	=	0.0

S-8637-2-0 & -3-0 (1,468 bhp Digester Gas-Fired, Lean Burn, IC Engines)

<b>PE1 (lb/qtr) S-8637-2-0 &amp; -3-0</b>					
	PE1 (lb/year)	÷	4 qtr/year	=	PE1 (lb/qtr)
NO <sub>x</sub>	0	÷	4 qtr/year	=	0.0
SO <sub>x</sub>	0	÷	4 qtr/year	=	0.0
PM <sub>10</sub>	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0

<b>PE2 (lb/qtr) S-8637-2-0 &amp; -3-0</b>					
	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO <sub>x</sub>	4,583	÷	4 qtr/year	=	1,145.8
SO <sub>x</sub>	1,134	÷	4 qtr/year	=	283.5
PM <sub>10</sub>	1,985	÷	4 qtr/year	=	496.3
CO	50,818	÷	4 qtr/year	=	12,704.5
VOC	3,185	÷	4 qtr/year	=	796.3

<b>Quarterly NEC [QNEC] S-8637-2-0 &amp; -3-0</b>					
	PE2 (lb/qtr)	-	PE1 (lb/qtr)	=	NEC (lb/qtr)
NO <sub>x</sub>	1,145.8	-	0.0	=	1,145.8
SO <sub>x</sub>	283.5	-	0.0	=	283.5
PM <sub>10</sub>	496.3	-	0.0	=	496.3
CO	12,704.5	-	0.0	=	12,704.5
VOC	796.3	-	0.0	=	796.3

## **APPENDIX B**

### **BACT Analysis for Digester Gas-Fired IC Engines**



SJVAPCD Best Available Control Technology (BACT) Guideline 3.3.15\*  
Last Update: 3/6/2013

Waste Gas-Fired IC Engine\*\*

Pollutant	Achieved in Practice or contained in SIP	Technologically Feasible	Alternate Basic Equipment
NO <sub>x</sub>	0.15 g/bhp-hr (lean-burn engine with SCR, rich-burn engine with 3-way catalyst, or other equivalent)		1. Fuel Cells (<0.05 lb/MW-hr) 2. Microturbines (<9 ppmv @ 15% O <sub>2</sub> ) 3. Gas Turbine (<9 ppmv @ 15% O <sub>2</sub> ) (Note: gas turbines only ABE for projects ≥ 3 MW)
SO <sub>x</sub>	Sulfur content of fuel gas ≤ 40 ppmv (as H <sub>2</sub> S) (dry absorption, wet absorption, chemical H <sub>2</sub> S reduction, water scrubber, or equivalent) (may be averaged up to 24 hours for compliance)		
PM <sub>10</sub>	Sulfur content of fuel gas ≤ 40 ppmv (as H <sub>2</sub> S)		
CO	2.0 g/bhp-hr		1. Fuel Cells (<0.10 lb/MW-hr) 2. Microturbines (<60 ppmv @ 15% O <sub>2</sub> ) 3. Gas Turbine (<60 ppmv @ 15% O <sub>2</sub> ) (Note: gas turbines only ABE for projects ≥ 3 MW)
VOC	0.10 g/bhp-hr (lean burn and positive crankcase ventilation (PCV) or a 90% efficient crankcase control device or equivalent)		Fuel Cells (<0.02 lb-VOC/MW-hr as CH <sub>4</sub> )
Ammonia (NH <sub>3</sub> ) Slip	≤ 10 ppmv @ 15% O <sub>2</sub>		

\*\* For the purposes of this determination, waste gas is a gas produced from the digestion of material excluding municipal sources such as waste water treatment plants, landfills, or any source where siloxane impurities are a concern.

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

\*This is a Summary Page for this Class of Source - Permit Specific BACT Determinations on Next Pages

3.3.15

## Top-Down BACT Analysis for Project S-1143770 Digester Gas-Fired IC Engines

Current District BACT Guideline 3.3.15 applies to the proposed waste gas-fired IC engines. In accordance with the District BACT policy, information from District BACT Guideline 3.3.15 will be utilized for the BACT analysis for the digester gas-fired engines proposed under this project.

### I. Proposal and Process Description

ABEC #3 LLC dba Lakeview Dairy Biogas, a subsidiary of California Bioenergy, LLC, has requested Authority to Construct (ATC) permits to construct a covered lagoon anaerobic digester system (ATC S-8637-1-0) and to install two 1,468 bhp digester gas-fired IC engines (or approved engines of equal or lesser bhp) (ATCs S-8637-2-0 and -3-0) at Lakeview Farms dairy (Facility S-5254). Each engine will be equipped with a selective catalytic reduction (SCR) system for emissions control and will power an electrical generator that will produce up to 1,059 kWe. The covered lagoon digester will utilize an air injection system for biological removal of H<sub>2</sub>S from the digester gas. After initial removal of H<sub>2</sub>S in the covered lagoon digester, the digester gas will be captured by the covered the lagoon gas collection system and will be piped to the gas conditioning system for polishing to remove additional H<sub>2</sub>S by an iron sponge scrubber and/or activated carbon or an equivalent H<sub>2</sub>S removal system and for removal of moisture. The cleaned digester gas, which consists mostly of methane, the main component of natural gas, will then be sent to the engines for use as fuel to generate electricity for sale to a utility and to produce heat for the digester system.

### II. BACT Applicability

#### New emissions units – PE > 2.0 lb/day

<b>New Emissions Unit BACT Applicability for S-8637-2-0 &amp; -3-0 After Commissioning</b>				
Pollutant	PE2 for each unit after commissioning (lb/day)	BACT Threshold (lb/day)	SSPE2 (lb/yr)	BACT Triggered?
NO <sub>x</sub>	11.7	> 2.0	N/A	Yes
SO <sub>x</sub>	3.1	> 2.0	N/A	Yes
PM <sub>10</sub>	5.4	> 2.0	N/A	Yes
CO	135.9	> 2.0 and SSPE2 ≥ 200,000 lb/yr	101,636	No
VOC	7.8	> 2.0	N/A	Yes
NH <sub>3</sub>	3.9	> 2.0	N/A	Yes

\* BACT is not required for CO from a new or modified emissions unit at a Stationary Source with an SSPE2 of less than 200,000 pounds per year of CO.

### III. Top-Down BACT Analyses for the Digester Gas-Fired Engines

As stated above, the information from the existing District BACT Guideline 3.3.15 for Waste Gas-Fired IC Engines will be utilized for the BACT analysis for the proposed digester gas-fired IC engines under this project.

#### 1. BACT Analysis for NO<sub>x</sub> Emissions:

##### a. Step 1 - List all control technologies

District BACT Guideline 3.3.15 lists the following options to reduce NO<sub>x</sub> emissions from waste gas-fired IC engines:

- 1) NO<sub>x</sub> emissions ≤ 0.15 g/bhp-hr (lean-burn engine with SCR, rich-burn engine with 3-way catalyst, or other equivalent) (Achieved in Practice)
- 2) Fuel Cell (≤ 0.05 lb/MW-hr) (Alternate Basic Equipment)
- 3) Microturbine (< 9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)
- 4) Gas Turbine (< 9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)

##### Description of Control Technologies

- 1) **NO<sub>x</sub> emissions ≤ 0.15 g/bhp-hr (9-11 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Selective Catalytic Reduction (SCR) or equivalent) (Achieved in Practice)**

A Selective Catalytic Reduction (SCR) system operates as an external control device where flue gases and a reagent (e.g. urea or ammonia) are passed through an appropriate catalyst. The reagent is used to reduce NO<sub>x</sub>, over the catalyst bed, to form elemental nitrogen, water vapor, and other by-products. The use of a catalyst typically reduces the NO<sub>x</sub> emissions by up to 90%.

- 2) **Fuel Cell (≤ 0.05 lb- NO<sub>x</sub>/MW-hr ≈ 1.5 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)**

Fuel cells use an electrochemical process to produce a direct electric current without the combustion of fuel. Fuel cells use externally supplied reactant gases (hydrogen and oxygen) that are combined in a catalytic process. Like a battery, the electric potential generated by a fuel cell is accessed by connecting an external load to the anode and cathode plates of the fuel cell. Because the fuel for a fuel cell is supplied externally, it does not run down like a battery. However, the fuel cell stack must be periodically replaced because of deactivation of catalytic materials contained in the fuel cell, which results in reduced conversion efficiencies. Since fuel cells require pure hydrogen gas for fuel, hydrocarbons used to power fuel cells must be purified and reformed prior to use. The reformation process can occur in an external fuel processor or through internal reforming in the fuel cell. Both molten carbonate fuel cells and solid oxide fuel cells can internally reform the hydrocarbon fuel to hydrogen for use in the fuel cell. Additionally, these high temperature fuel cells are tolerant of CO<sub>2</sub> that is found in biogas.

Fuel cells have recently been commercialized and offer the advantages of high efficiency, nearly negligible emissions, and very quiet power generation. The greatest deterrent to increased use of fuel cells is the significantly higher expense when compared to other generation technologies. These higher costs include the initial capital expense and, for biogas installations, the increased ongoing expenses associated with the extensive cleanup required to remove contaminants that can poison fuel cell catalysts. Although this expense can be substantial, biogas-fueled fuel cells have been installed at some wastewater treatment plants and fuel cells have also been fueled with other types of biogas (e.g. landfill gas and brewery wastewater gas).

### **3) Gas Turbine (< 9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)**

Gas turbines are internal combustion engines that operate on the Brayton (Joule) combustion cycle rather than the Otto combustion cycle used in reciprocating internal combustion engines or the diesel cycle for diesel engines. In the Brayton cycle the air flow and fuel injection are steady, and the different parts of the cycle occur continuously within different components of the system. In a gas turbine, fuel is continually injected into the combustion chamber or combustor and air is constantly drawn into the turbine and compressed. All elements of the Brayton cycle occur simultaneously in a gas turbine.

Gas turbines are one of the cleanest means of generating electricity. With the use of lean pre-mixed combustion or catalytic exhaust cleanup, NO<sub>x</sub> emissions from large gas-fired turbines are generally in the single-digit ppmv range. These levels are generally for natural gas-fired units but they are considered technologically feasible for biogas-fired units.

Gas turbines are available in sizes ranging from 500 kW - 25 MW. Based on contacts with turbine suppliers, biogas-fired turbines used to produce electricity are expected to be available in the size range of 2 - 7 MW. According to Solar Turbines, the smaller biogas-fired turbines are no longer actively produced or marketed since this size range is generally covered by other generation technologies such as reciprocating IC engines and microturbines.

### **4) Microturbine (< 9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)**

Microturbines are small gas turbines rated between 25 kW and 500 kW that burn gaseous and liquid fuels to generate electricity or provide mechanical power. Microturbines were developed from turbocharger technologies found in large trucks and the turbines in aircraft auxiliary power units. Microturbines can be operated on a wide variety of fuels, including natural gas, liquefied petroleum gas, gasoline, diesel, landfill gas, and digester gases. According to the California Air Resources Board (ARB), there were approximately 200 biogas-fired microturbines operating in California as of the year 2006.<sup>5</sup> Microturbines generally have electrical efficiencies

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<sup>5</sup> "Staff Report: Initial Statement of Reasons for Proposed Amendments to the Distributed Generation Certification Regulation" (9/1/2006), Cal EPA - ARB, Executive Summary Pg. ii (<http://www.arb.ca.gov/regact/dg06/dgisor.pdf>)

of 25-30%; however, the electrical efficiency of larger microturbines ( $\geq 200$  kW) can range from 30-33%. Microturbine manufacturers include Capstone Microturbines and FlexEnergy.

Microturbines without add-on controls can meet very stringent emission limits and have significantly lower emissions of  $\text{NO}_x$ , CO, and VOC than uncontrolled reciprocating engines because most microturbines operating on gaseous fuels utilize lean premixed (dry low  $\text{NO}_x$ , or DLN) combustion technology. Microturbines manufacturers will generally guarantee  $\text{NO}_x$  emissions of 9-15 ppmv @ 15%  $\text{O}_2$ . However, several emission tests performed on biogas-fired microturbines have demonstrated even lower emissions. A small number of dairy digester gas-fired microturbines have been installed<sup>6</sup>, including Twin Birch Dairy and New Hope Farm View dairy and Twin Birch Dairy in New York, and den Dulk Dairy in Michigan.

The proposed project is for a large waste gas to energy facility and, although larger microturbines have recently become available, several microturbines (at least 4) would still be required to replace each engine. The applicant states that when they investigated microturbines they found that they could not secure the necessary financing for a waste gas to energy project of this size using microturbines and that the major microturbines vendors were unable to secure the debt. Although microturbines may not currently be a practical option for this particular project, they will be considered in the cost analysis below.

## **b. Step 2 - Eliminate technologically infeasible options**

### Option 3 - Gas Turbine ( $\leq 9$ ppmv $\text{NO}_x$ @ 15% $\text{O}_2$ ) (Alternate Basic Equipment)

Option 3, Gas Turbine, was determined to be infeasible for the proposed project because the available information indicates that the principal suppliers of gas turbines (Solar Turbines, Allison, and General Electric) do not currently produce or market waste gas-fired gas turbines rated less than 3 MW since this size range is generally covered by other generation technologies such as reciprocating IC engines and microturbines.

The cost information given in the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies<sup>7</sup> (March 2015) and the SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>8</sup> (October 5, 2015) also supports that gas turbines rated approximately 3 MW are not generally available. The smallest turbine for which the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies provides cost information is 3,304 kW and the smallest turbine for which the SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report] provides cost information is 2,500 kW.

<sup>6</sup> See EPA AgStar Program "AgStar Project Profiles", <http://www2.epa.gov/agstar/agstar-project-profiles>

<sup>7</sup> US EPA Combined Heat and Power Partnership "Catalog of CHP Technologies" (March 2015)  
<http://www.epa.gov/chp/catalog-chp-technologies>

<sup>8</sup> SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report] (October 5, 2015)  
<http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=7889>

The proposed project would require gas turbines rated 1,059 kW each, which is below the range that is currently being marketed by turbine manufacturers; therefore, gas turbines are not considered feasible for this particular project and will be eliminated from consideration at this time.

**c. Step 3 - Rank remaining options by control effectiveness**

- 1) Fuel Cell ( $\leq 0.05$  lb/MW-hr  $\approx 1.5$  ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)
- 2) Digester gas-fueled microturbines (Alternate Basic Equipment)
- 3) NO<sub>x</sub> emissions  $\leq 0.15$  g/bhp-hr (lean-burn engine with SCR, rich-burn engine with 3-way catalyst, or other equivalent) (Achieved in Practice)

**d. Step 4 - Cost Effectiveness Analysis**

Pursuant to Section IX.D of District Policy APR 1305 – BACT Policy, a cost effectiveness analysis is required for the options that have not been determined to be achieved in practice. In accordance with the District's Revised BACT Cost Effectiveness Thresholds Memo (5/14/08), to determine the cost effectiveness of particular technologically feasible control options or alternate equipment options, the amount of emissions resulting from each option will be quantified and compared to the District Standard Emissions allowed by the District Rule that is applicable to the particular unit. The emission reductions will be equal to the difference between the District Standard Emissions and the emissions resulting from the particular option being evaluated.

The District has determined that the proposed digester gas-fueled IC engines are non-agricultural IC engines. The lean burn, digester gas-fired, engines are subject to the following emission limits for non-agricultural, lean burn, waste gas fueled IC engines contained in District Rule 4702, Section 5.2.2, Table 2, 2.d: 65 ppmvd NO<sub>x</sub> (or 90% reduction), 2,000 ppmvd CO, and 750 ppmvd VOC (all measured @ 15% O<sub>2</sub>). The proposed digester engines are also subject to the New Source Performance Standards (NSPS) for IC Engines contained in 40 CFR 60 Subpart JJJJ, which includes a more stringent VOC emissions limit of 1.0 g/bhp-hr (or 80 ppmv @ 15% O<sub>2</sub> reported as propane) for landfill and digester gas-fired IC engines. Therefore, the District Standard Emissions used for the BACT cost analysis below for the proposed engines will be based on the emission limits contained in these applicable regulations.

Option 1: Fuel Cells ( $\leq 0.05$  lb/MW-hr  $\approx 1.5$  ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)

Because fuel cells have reduced NO<sub>x</sub> and VOC emissions in comparison to a reciprocating IC engine, a Multi-Pollutant Cost Effectiveness Threshold (MCET) will be used to determine if this option is cost-effective. The following cost analysis demonstrates that replacement of the proposed engines with a fuel cell is not cost effective even when the additional operation costs of a fuel cell are not considered.

## Assumptions

- Digester Gas F-Factor: 9,100 dscf/MMBtu (dry, adjusted to 60 °F)
- Higher Heating Value for Dairy Digester Gas: 600 Btu/scf
- Molar Specific Volume = 379.5 scf/lb-mol (at 60°F)
- Price for electricity: \$127.72/MW-hr (*based on the California Bioenergy Market Adjusting Tariff (BioMAT) initial contract price offered by Investor Owned Utilities (PG&E, SCE, and SDG&E)<sup>9</sup> in February 2016*)
- bhp-hr to Btu conversion: 2,545 Btu/hp-hr
- Btu to kW-hr conversion: 3,413 Btu/kW-hr
- The initial capital costs and the operation costs for the digester gas-fueled IC engines and fuel cells will be based on information given in the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies<sup>7</sup> and the SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>8</sup>
- Because the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies only provides cost information for natural gas-fueled engines and fuel cells, additional capital costs for the use of biogas are taken from the SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>8</sup>

### Assumptions for Proposed Digester Gas-Fired IC Engines (S-8637-2-0 & -3-0)

- Each engine will operate at full load for 24 hours/day and 8,760 hours/year
- Typical efficiency for IC engines: 33% (*Conservative estimate, as discussed above, US EPA Combined Heat and Power Partnership Catalog of CHP Technologies lists HHV electrical efficiencies of 34.5% for a 633 kW system and 36.8% for a 1,121 kW system*)
- The maximum total daily heating value of the digester gas used by each engine will be: 271.71 MMBtu/day ( $1,468 \text{ bhp}_{out}/engine \times 1 \text{ bhp}_{in}/0.33 \text{ bhp}_{out} \times 2,545 \text{ Btu}_{in}/\text{bhp}_{in}\text{-hr} \times 1 \text{ MMBtu}/10^6 \text{ Btu} \times 24 \text{ hr}/\text{day} \times 1 \text{ engine}$ )
- The maximum total annual heating value for of the digester gas used by each engine will be: 99,175.4 MMBtu/year ( $1,468 \text{ bhp}_{out}/engine \times 1 \text{ bhp}_{in}/0.33 \text{ bhp}_{out} \times 2,545 \text{ Btu}_{in}/\text{bhp}_{in}\text{-hr} \times 1 \text{ MMBtu}/10^6 \text{ Btu} \times 8,760 \text{ hr}/\text{year} \times 1 \text{ engine}$ )
- Estimated purchase and installation cost for CHP IC engine rated approximately 1,059 kW without add-on air pollution control equipment: \$1,752/kW (*average of interpolated values from US EPA Combined Heat and Power Partnership Catalog of CHP Technologies and SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Additional capital investment for biogas conditioning and cleanup for IC engines: \$387/kW (*SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)

<sup>9</sup> See: <http://www.pge.com/en/b2b/energysupply/wholesaleelectricssuppliersolicitation/BioMAT/index.page>, <https://scebiomat.accionpower.com/biomat/home.asp>, and <http://www.sdge.com/procurement/bioenergy-market-adjusting-tariff-bio-mat>)

- Total Installation Cost for biogas-fueled IC engine rated 1,059 kW: \$2,139/kW
- Estimated operation costs for CHP IC engine rated 1,059 kW without add-on air pollution control costs: \$0.020/kW-hr (*average of interpolated values from US EPA Combined Heat and Power Partnership Catalog of CHP Technologies and SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- The SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report] indicates that biogas conditioning/cleanup costs are highly dependent on the quantity of biogas being processed and contaminants being removed and that the differences in clean-up costs for biogas-fueled IC engines, microturbines, and gas turbines “reflect the greater rigor in the removal of the hydrogen sulfide”. The digester gas used to fuel the engines must be limited to a sulfur content of no more than 40 ppmv as H<sub>2</sub>S to satisfy BACT for SO<sub>x</sub>. Because required level of sulfur removal is adequate for use in the engines, there will be no increase in operating costs related to cleaning the digester gas for use in IC engines.
- Rule 4702 NO<sub>x</sub> emission limit for non-agricultural, lean burn IC engines: 65 ppmv @ 15% O<sub>2</sub> = 0.2540 lb/MMBtu
- Rule 4702 VOC emission limit for non-agricultural, lean burn IC engines: 750 ppmv @ 15% O<sub>2</sub> as CH<sub>4</sub> = 1.0193 lb/MMBtu
- 40 CFR 60 Subpart JJJJ VOC emission limit for landfill and digester gas-fired IC engines: 1.0 g/bhp-hr (or 80 ppmv @ 15% O<sub>2</sub> reported as propane)

#### Assumptions for Fuel Cell System

- Net electrical efficiency for a molten carbonate fuel cell (MCFC): 45% (*US EPA Combined Heat and Power Partnership Catalog of CHP Technologies gives efficiencies of 47% for a 300 kW MCFC and 42.5% for a 1,400 kW MCFC*)
- Size of fuel cell system needed to replace each proposed engine: 1,500 kW (estimated based on 271.71 MMBtu/day and 45% efficiency)
- Estimated Purchase and Installation Cost for Molten Carbonate Fuel Cell: \$4,550/kW (*Average of the two costs for largest Molten Carbonate Fuel Cells given in US EPA Combined Heat and Power Partnership document Catalog of CHP Technologies and SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]; The U.S. Department of Energy Federal energy management Program (FEMP) document “Fuel Cells and Renewable Energy” (last updated 12-1-2014 and available at: <http://www.wbdg.org/resources/fuelcell.php>) states, “Installation costs of a fuel cell system can range from \$5,000/kW to \$10,000/kW.” Therefore, this estimate may be actually too low based on the recently reported costs for fuel cell power plants, such as the “Bloom Box”.*)
- Additional capital investment for biogas conditioning and cleanup for fuel cells: \$563/kW (*SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Total Installation Cost for biogas-fueled fuel cells rated ≥ 1,200 kW: \$5,113/kW



- Typical operation costs for natural gas-fueled fuel cells, including stack replacement costs: \$0.04/kW-hr (*SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Additional operational costs for biogas conditioning and cleanup for large fuel cells: \$0.15/kW-hr (*SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Total Operation Cost for biogas-fueled fuel cells rated  $\geq 1,200$  kW: \$0.19/kW-hr
- Fuel Cell NO<sub>x</sub> emissions: 0.01 - 0.02 lb/MW-hr (*Note: Fuel cells have been certified to the ARB Distributed Generation Certification level of 0.07 lb-NO<sub>x</sub>/MW-hr but measured emissions from fuel cells are generally much lower*)
- Fuel Cell VOC emissions: 0.02 lb-VOC/MW-hr ( $\leq 2.0$  ppmv VOC @ 15% O<sub>2</sub> as CH<sub>4</sub> based on ARB Distributed Generation Certification level of 0.02 lb-VOC/MW-hr and emission tests on fuel cells)
- Unlike the proposed engines, a high-temperature fuel cell power plant must primarily operate at steady state conditions; there would not be the ability to store gas to generate more electricity during peak hours, which is the current business plan of the applicant. Because the price paid for electricity is greater during peak hours and less during other times, the price paid for electricity generated by a fuel cell power plant would be less. This would require the operator to alter their plans of operation and result in less revenue per kW-hr of electricity generated potentially offsetting the revenue from increased power generating capacity because of the higher efficiency of a fuel cell power plant. For more conservative analysis, the difference in the cost of peak and off-peak electricity was not considered in this comparison.

#### Capital Cost

The estimated increased incremental capital cost for replacement of the proposed engines with fuel cells is calculated based on the difference in cost of a fuel cell power plant and the proposed IC engines.

The incremental capital cost for replacement of the proposed IC engines with a fuel cell power plant is calculated as follows:

$$(1,500 \text{ kW} \times \$5,113/\text{kW}) - (1,059 \text{ kW} \times \$2,139/\text{kW}) = \$5,404,299$$

#### Annualized Capital Cost

Pursuant to District Policy APR 1305, section X (11/09/99), the incremental capital cost for the purchase of the fuel cell system will be spread over the expected life of the system using the capital recovery equation. The expected life of the entire system will be estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$$A = [P \times i(1+i)^n] / [(1+i)^n - 1]$$

Where: A = Annual Cost  
P = Present Value  
I = Interest Rate (10%)  
N = Equipment Life (10 years)

$$A = [\$5,404,299 \times 0.1(1.1)^{10}] / [(1.1)^{10} - 1]$$
$$= \mathbf{\$879,525/year}$$

#### Annual Costs

##### Electricity Generated

The amount of electricity potentially generated by each option is calculated as follows:

##### Each Proposed IC Engine

$$1,059 \text{ kW} \times 8,760 \text{ hr/yr} = 9,276,840 \text{ kW-hr/year}$$

##### Fuel Cells (Alternate Equipment)

$$271.71 \text{ MMBtu/day} \times 10^6 \text{ Btu/MMBtu} \times 1 \text{ day/24 hr} \times 1 \text{ kW-hr/3,413 Btu} \times 0.45 \text{ (electrical efficiency)} = 1,493 \text{ kW}$$

$$99,175.4 \text{ MMBtu/yr} \times 10^6 \text{ Btu/MMBtu} \times 1 \text{ kW-hr/3,413 Btu} \times 0.45 \text{ (electrical efficiency)} = 13,076,159 \text{ kW-hr /year}$$

##### Cost Decrease from Increased Revenue for Power Generation from Replacing each Proposed 1,059 kW Engine with a Fuel Cell

$$(9,276,840 \text{ kW-hr/yr} - 13,076,159 \text{ kW-hr/yr}) \times 1 \text{ MW/1,000 kW} \times \$127.72/\text{MW-hr} = -\$485,249/\text{year}$$

##### Annual Operation and Maintenance Cost

The annual operation and maintenance costs for each option are calculated as follows:

##### Each Proposed 1,059 IC kW Engine

$$9,276,840 \text{ kW-hr/yr} \times \$0.020/\text{kW-hr} = \$185,537/\text{year}$$

##### Fuel Cells (Alternate Equipment)

$$13,076,159 \text{ kW-hr/yr} \times \$0.19/\text{kW-hr} = \$2,484,470/\text{year}$$

##### Annual Costs of Increased Maintenance

$$\$2,484,470/\text{yr} - \$185,537/\text{yr} = \$2,298,933/\text{year}$$

##### Total Increased Annual Costs for Fuel Cell as an Alternative to Each Proposed Engine

$$\$879,525/\text{year} + (-\$485,249/\text{year}) + \$2,298,933/\text{year} = \mathbf{\$2,693,209/\text{year}}$$

Emission Reductions:

NO<sub>x</sub> and VOC Emission Factors:

Pursuant to the District's Revised BACT Cost Effectiveness Thresholds Memo (5/14/08), District Standard Emissions that will be used to calculate the emission reductions from alternative equipment.

The District Standard Emissions for NO<sub>x</sub> emissions from the engines will be based on the NO<sub>x</sub> emission limit for non-agricultural, lean burn IC engines from District Rule 4702, Section 5.2.1, Table 1, 2.b. The District Standard Emissions for VOC emissions from the engines will be based on the New Source Performance Standard (NSPS) VOC emission limit for landfill and digester gas-fired IC engines from 40 CFR 60 Subpart JJJJ, since this limit is more stringent than the applicable emission limit in District Rule 4702.

The following emissions factors will be used for the cost analysis:

District Standard Emissions: 0.2540 lb-NO<sub>x</sub>/MMBtu (65 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) and 1.0 g-VOC/bhp-hr

Emissions from Fuel Cells as Alternative Equipment: 0.01 lb-NO<sub>x</sub>/MW-hr and 0.02 lb-VOC/MW-hr as CH<sub>4</sub>

Emission Reductions:

Each Proposed Engine Compared to Fuel Cells based on District Standard Emission Reductions

NO<sub>x</sub> Emission Reductions (65 ppmv @ 15% O<sub>2</sub> → 0.01 lb-NO<sub>x</sub>/MW-hr)  
(99,175.4 MMBtu/yr x 0.2540 lb-NO<sub>x</sub>/MMBtu) – (13,076,159 kW-hr/yr x  
1 MW/1,000 kW x 0.01 lb-NO<sub>x</sub>/MW)  
= 25,060 lb-NO<sub>x</sub>/year (12.53 ton-NO<sub>x</sub>/year)

VOC Emission Reductions (1.0 g/bhp-hr → 0.02 lb-VOC/MW-hr)  
(1,468 bhp/engine x 8,760 hr/yr x 1 engine x 1.0 g-VOC/bhp-hr x 1 lb/453.59 g) –  
(13,076,159 kW-hr/yr x 1 MW/1,000 kW x 0.02 lb-VOC/MW)  
= 28,089 lb-VOC/year (14.04 ton-VOC/year)

Multi-Pollutant Cost Effectiveness Thresholds (MCET) for NO<sub>x</sub> and VOC Reductions based on District Standard Emission Reductions

(12.53 ton-NO<sub>x</sub>/year x \$24,500/ton-NO<sub>x</sub>) + (14.04 ton-VOC/year x \$17,500/ton-VOC)  
= **\$552,685/year**

As shown above, the annualized capital cost of this alternate option exceeds the Multi-Pollutant Cost Effectiveness Threshold (MCET) calculated for the NO<sub>x</sub> and VOC emission reductions. Therefore, this option is not cost effective and is being removed from consideration.

Option 2 - Microturbines ( $\leq 9$  ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>) (Alternate Basic Equipment)

The cost analysis below demonstrates that the NO<sub>x</sub> emission reductions achieved by replacement of the proposed engines with microturbines would not be cost effective based on the District's Revised BACT Cost Effectiveness Thresholds (May 14, 2008).

In addition, it should be noted that large lean burn IC engines generally have higher overall efficiencies than microturbines. The difference in efficiency between engines and microturbines will minimize and possibly eliminate any overall differences in NO<sub>x</sub> emissions between these options. For example, information from a Capstone Turbine Corporation specification sheet indicates that the guaranteed NO<sub>x</sub> emissions rate of 9 ppmvd @ 15% O<sub>2</sub> for their 1,000 kW renewable gas fuel microturbine package is equivalent to 0.14 g-NO<sub>x</sub>/hp-hr.<sup>10</sup> This level is not significantly different than the current BACT requirement for waste gas-fired engines of 0.15 g-NO<sub>x</sub>/bhp-hr.

The following discussion demonstrates how the difference the efficiency of engines and microturbines can affect the emission rate. NO<sub>x</sub> emissions from the engines will be limited to no more than 0.15 g/bhp-hr (approximately 11 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>). Microturbine suppliers will generally guarantee NO<sub>x</sub> emissions  $\leq 9$  ppmv @ 15% O<sub>2</sub> For digester gas-fired microturbines. The US EPA Combined Heat and Power Partnership "Catalog of CHP Technologies"<sup>11</sup> (March 2015), Table 2-2: Gas Spark Ignition Engine CHP - Typical Performance Parameters, lists HHV electrical efficiencies of 34.5% for a 633 kW system and 36.8% for a 1,121 kW system. The SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>12</sup> (October 5, 2015), Page A-28 indicates that "Typical observed efficiencies on IC engines deployed in the SGIP are 27% for electrical conversion (HHV)..." Therefore, the expected HHV electrical efficiency of each of the proposed 1,059 kW engines is between 27-36.8%.

The US EPA Combined Heat and Power Partnership "Catalog of CHP Technologies"<sup>11</sup>, Table 5-2: Gas Spark Ignition Engine CHP - Microturbine Cost and Performance Characteristics, lists HHV electrical efficiencies of 26-28% for microturbine systems rated at least 200 kW. The SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>12</sup>, Table A-15: Microturbine Electrical Conversion Efficiency, lists a HHV electrical efficiencies of 21% for microturbines based on SGIP metered data. Therefore, the expected HHV electrical efficiency of large microturbines is between 21-28%.

The maximum expected NO<sub>x</sub> emission factor for the proposed engine-generator sets is approximately 0.47 lb/MW-hr (based on 0.15 g/bhp-hr and 95% generator efficiency). Based on 9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub> and the expected range of microturbine electrical conversion efficiency given above, the NO<sub>x</sub> emission factor from large digester gas-

<sup>10</sup> See: <http://www.adigo.no/wordpress/wp-content/uploads/2015/02/CR1000-teknisk-spesifikasjon-engelsk.pdf>. Note that because of lower efficiencies for smaller microturbines, the guaranteed emission rate of 9 ppmvd NO<sub>x</sub> @ 15% O<sub>2</sub> from smaller units will actually be higher than 0.15 g-NO<sub>x</sub>/bhp-hr

<sup>11</sup> US EPA Combined Heat and Power Partnership "Catalog of CHP Technologies" (March 2015)  
<http://www.epa.gov/chp/catalog-chp-technologies>

<sup>12</sup> SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report] (October 5, 2015)  
<http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=7889>

fueled microturbines is expected to range from 0.43 – 0.57 lb/MW-hr. Because, the maximum NO<sub>x</sub> emission factor for the proposed engine-generator sets falls within this range, the options could be considered equivalent.

### Assumptions

- Digester Gas F-Factor: 9,100 dscf/MMBtu (dry, adjusted to 60 °F)
- Higher Heating Value for Dairy Digester Gas: 600 Btu/scf
- Molar Specific Volume = 379.5 scf/lb-mol (at 60°F)
- bhp-hr to Btu conversion: 2,545 Btu/hp-hr
- Btu to kW-hr conversion: 3,413 Btu/kW-hr
- The initial capital costs and the operation costs for the digester gas-fueled IC engines and microturbines will be based on information given in the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies<sup>11</sup> and the SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>12</sup>
- Because the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies only provides cost information for natural gas-fueled engines and microturbines, additional capital costs for the use of biogas are taken from the SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]<sup>12</sup>
- The SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report] indicates that biogas conditioning/cleanup costs are highly dependent on the quantity of biogas being processed and contaminants being removed and that the differences in clean-up costs for biogas-fueled IC engines, microturbines, and gas turbines “reflect the greater rigor in the removal of the hydrogen sulfide”. The digester gas used to fuel the engines or microturbines must be limited to a sulfur content of no more than 40 ppmv as H<sub>2</sub>S to satisfy BACT for SO<sub>x</sub>. Because required level of sulfur removal is adequate for use in both engines and microturbines and the same amount of total digester gas will be available for either option, there will be no difference in operating costs related to cleaning the digester gas for use in IC engines or microturbines.
- Price for electricity: \$127.72/MW-hr (based on the California Bioenergy Market Adjusting Tariff (BioMAT) initial contract price offered by Investor Owned Utilities (PG&E, SCE, and SDG&E)<sup>9</sup> in February 2016)

### Assumptions for Proposed Digester Gas-Fired IC Engines (S-8637-2-0 & -3-0)

- Each engine will operate at full load for 24 hours/day and 8,760 hours/year
- Typical efficiency for IC engines: 33% (*Conservative estimate, as discussed above, the US EPA Combined Heat and Power Partnership Catalog of CHP Technologies lists HHV electrical efficiencies of 34.5% for a 633 kW system and 36.8% for a 1,121 kW system*)
- The maximum total daily heating value of the digester gas used by each engine will be: 271.71 MMBtu/day ( $1,468 \text{ bhp}_{out}/\text{engine} \times 1 \text{ bhp}_{in}/0.33 \text{ bhp}_{out} \times 2,545 \text{ Btu}_{in}/\text{bhp}_{in}\text{-hr} \times 1 \text{ MMBtu}/10^6 \text{ Btu} \times 24 \text{ hr}/\text{day} \times 1 \text{ engine}$ )

- The maximum total annual heating value for of the digester gas used by each engine will be: 99,175.4 MMBtu/year ( $1,468 \text{ bhp}_{out}/engine \times 1 \text{ bhp}_{in}/0.33 \text{ bhp}_{out} \times 2,545 \text{ Btu}_{in}/\text{bhp}_{in}\text{-hr} \times 1 \text{ MMBtu}/10^6 \text{ Btu} \times 8,760 \text{ hr}/\text{year} \times 1 \text{ engine}$ )
- Estimated purchase and installation cost for CHP IC engine rated approximately 1,059 kW without add-on air pollution control equipment: \$1,752/kW (*average of interpolated values from US EPA Combined Heat and Power Partnership Catalog of CHP Technologies and SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Additional capital investment for biogas conditioning and cleanup for IC engines: \$387/kW (*SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Total Installation Cost for biogas-fueled IC engine rated 1,059 kW: \$2,139/kW
- Estimated operation costs for CHP IC engine rated 1,059 kW without add-on air pollution control costs: \$0.020/kW-hr (*average of interpolated values from US EPA Combined Heat and Power Partnership Catalog of CHP Technologies and SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Rule 4702 NO<sub>x</sub> emission limit for non-agricultural, lean burn IC engines: 65 ppmv @ 15% O<sub>2</sub> = 0.2540 lb/MMBtu

#### Assumptions for Microturbines

- Net HHV electrical efficiency for a 950 kW net (1,000 kW nominal capacity) microturbine package: 24.5% (*conservative estimate, SGIP metered data indicates an efficiency of 21%*)
- Estimated Size of microturbine system needed to replace each engine: 950 kW net (1,000 kW nominal capacity)
- Estimated Purchase and Installation Cost for 950 kW net (1,000 kW nominal capacity) microturbine package: \$2,500/kW (*from US EPA Combined Heat and Power Partnership Catalog of CHP Technologies*)
- Estimated additional capital investment for biogas conditioning and cleanup for microturbines: \$744/kW (*SGIP 2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]*)
- Total Installation Cost for biogas-fueled microturbine system rated 950 kW net (1,000 kW nominal capacity): \$3,244/kW
- Typical operation costs for a 950 kW net (1,000 kW nominal capacity) microturbine package: \$0.012/kW-hr (*from US EPA Combined Heat and Power Partnership Catalog of CHP Technologies*)
- NO<sub>x</sub> Emissions for Digester gas-fueled microturbines: ≤ 9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub> (~ 0.0352 lb-NO<sub>x</sub>/MMBtu)

Capital Cost

The estimated increased incremental capital cost for replacement of each the proposed engines with microturbines is calculated based on the difference in cost of a microturbine system and the proposed IC engines.

The incremental capital cost for replacement of the proposed IC engines with a microturbine system is calculated as follows:

$$(950 \text{ kW} \times \$3,244/\text{kW}) - (1,059 \text{ kW} \times \$2,139/\text{kW}) = \$816,599$$

Annualized Capital Cost

Pursuant to District Policy APR 1305, section X (11/09/99), the incremental capital cost for the purchase of the fuel cell system will be spread over the expected life of the system using the capital recovery equation. The expected life of the entire system will be estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$$A = [P \times i(1+i)^n] / [(1+i)^n - 1]$$

Where: A = Annual Cost  
P = Present Value  
I = Interest Rate (10%)  
N = Equipment Life (10 years)

$$A = [\$816,599 \times 0.1(1.1)^{10}] / [(1.1)^{10} - 1]$$

$$= \mathbf{\$132,898/\text{year}}$$

Annual Costs

Electricity Generated

The amount of electricity potentially generated by each option is calculated as follows:

Each Proposed IC Engine

$$1,059 \text{ kW} \times 8,760 \text{ hr/yr} = 9,276,840 \text{ kW-hr/year}$$

950 kW (net) Microturbine Package (Alternate Equipment)

$$271.71 \text{ MMBtu/day} \times 10^6 \text{ Btu/MMBtu} \times 1 \text{ day}/24 \text{ hr} \times 1 \text{ kW-hr}/3,413 \text{ Btu} \times 0.245 \text{ (electrical efficiency)} = 813 \text{ kW}$$

$$99,175.4 \text{ MMBtu/yr} \times 10^6 \text{ Btu/MMBtu} \times 1 \text{ kW-hr}/3,413 \text{ Btu} \times 0.245 \text{ (electrical efficiency)} = 7,119,242 \text{ kW-hr /year}$$

Cost of Decreased Revenue from Power Generation from Replacing each Proposed 1,059 kW Engine with Microturbines

$$(9,276,840 \text{ kW-hr/yr} - 7,119,242 \text{ kW-hr/yr}) \times 1 \text{ MW}/1,000 \text{ kW} \times \$127.72/\text{MW-hr} = \$275,568/\text{year}$$

Annual Operation and Maintenance Cost

The annual operation and maintenance costs for each option are calculated as follows:

Each Proposed 1,059 kW IC Engine

9,276,840 kW-hr/yr x \$0.020/kW-hr = \$185,537/year

Microturbines (Alternate Equipment)

7,119,242 kW-hr/yr x \$0.012/kW-hr = \$85,431/year

Cost from Annual Decrease in Maintenance Costs

\$85,431/yr - \$185,537/yr = -\$100,106/year

Total Increased Annual Costs for Microturbines as an Alternative to Each Proposed Engine

\$132,898/year + \$275,568/year + (-\$100,106/year) = **\$308,360/year**

Emission Reductions:

NO<sub>x</sub> Emission Factors:

Pursuant to the District's Revised BACT Cost Effectiveness Thresholds Memo (5/14/08), District Standard Emissions that will be used to calculate the emission reductions from alternative equipment.

The District Standard Emissions for NO<sub>x</sub> emissions from the engines will be based on the NO<sub>x</sub> emission limit for non-agricultural, lean burn IC engines from District Rule 4702, Section 5.2.1, Table 1, 2.b.

The following emissions factors will be used for the cost analysis:

District Standard Emissions: 0.2540 lb-NO<sub>x</sub>/MMBtu (65 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>)

Emissions from Microturbines as Alternative Equipment: 0.0352 lb-NO<sub>x</sub>/MMBtu (9 ppmv NO<sub>x</sub> @ 15% O<sub>2</sub>)

Emission Reductions for Each Proposed Engine Compared to Microturbines based on District Standard Emission Reductions

NO<sub>x</sub> Emission Reductions (65 ppmv @ 15% O<sub>2</sub> → 9 ppmv @ 15% O<sub>2</sub>)

99,175.4 MMBtu/yr x (0.2540 lb-NO<sub>x</sub>/MMBtu - 0.0352 lb-NO<sub>x</sub>/MMBtu)  
= 21,700 lb-NO<sub>x</sub>/year (10.85 ton-NO<sub>x</sub>/year)

Cost of NO<sub>x</sub> Emission Reductions

Cost of reductions = (\$308,360/year)/[(21,700 lb-NO<sub>x</sub>/year)(1 ton/2000 lb)]  
= **\$28,420/ton of NO<sub>x</sub> reduced**

As shown above, the cost of the NO<sub>x</sub> emission reductions for replacing each of the proposed engines with microturbines exceeds the \$24,500/ton cost effectiveness



threshold of the District BACT policy. Therefore, this option is not cost effective and is being removed from consideration.

Option 3: NO<sub>x</sub> emissions ≤ 0.15 g/bhp-hr (lean-burn engine with SCR, rich-burn engine with 3-way catalyst, or other equivalent) (Achieved in Practice)

This option is achieved practice and has been proposed by the applicant; therefore a cost analysis is not required.

#### **e. Step 5 - Select BACT**

Pursuant to the above BACT Analysis, BACT for the Digester Gas-fired Engines must be satisfied with the following: NO<sub>x</sub>: NO<sub>x</sub> emissions to ≤ 0.15 g/bhp-hr

The applicant has proposed to use SCR systems for the digester gas-fired lean burn IC engines to reduce NO<sub>x</sub> emissions to ≤ 0.15 g/bhp-hr. Therefore, the BACT requirements are satisfied.

## **2. BACT Analysis for SO<sub>x</sub> Emissions:**

### **a. Step 1 - Identify all control technologies**

The following options were identified to reduce SO<sub>x</sub> emissions from the proposed engine:

- 1) Sulfur Content of fuel gas not exceeding 40 ppmv as H<sub>2</sub>S (Achieved in Practice/Contained in SIP)

There are no options listed in the SJVUAPCD BACT Clearinghouse as alternate basic equipment.

### **b. Step 2 - Eliminate technologically infeasible options**

There are no technologically infeasible options to eliminate from step 1.

### **c. Step 3 - Rank remaining options by control effectiveness**

The control efficiency of each of the options above is estimated and the controls are ranked below based on the control effectiveness.

- 1) Sulfur Content of fuel gas not exceeding 40 ppmv as H<sub>2</sub>S (Achieved in Practice)

### **d. Step 4 - Cost Effectiveness Analysis**

The only option above is achieved practice and has been proposed by the applicant; therefore a cost analysis is not required.

**e. Step 5 - Select BACT**

Pursuant to the above BACT Analysis, BACT for SO<sub>x</sub> emissions from the proposed engines is fuel gas sulfur content not exceeding 40 ppmv as H<sub>2</sub>S. The applicant has proposed to use a biological sulfur removal system and iron sponge and/or carbon canister scrubbers (or an equivalent sulfur removal system) to reduce the sulfur content of the digester gas combusted in the engines to ≤ 40 ppmv as H<sub>2</sub>S. Therefore, the BACT requirements for SO<sub>x</sub> are satisfied.

**3. BACT Analysis for PM<sub>10</sub> Emissions:**

**a. Step 1 - Identify all control technologies**

Combustion of gaseous fuels generally does not result in significant emissions of particulate matter. Dairy anaerobic digester gas is the planned fuel for the proposed IC engines. The anaerobic digester gas will be composed primarily of methane (approximately 60% molar composition) and CO<sub>2</sub> (approximately 40% molar composition) and is expected to burn in a fairly clean manner. Particulate emissions from combustion of the digester gas are expected to primarily result from the incineration of fuel-borne sulfur compounds (mostly H<sub>2</sub>S) resulting in the formation of sulfur-containing particulate. Therefore, scrubbing of the digester gas is the principal means to reduce particulate emissions.

The following control was identified to reduce particulate matter emissions from combustion of the digester gas as fuel in the proposed engines:

- 1) Sulfur Content of fuel ≤ 40 ppmv as H<sub>2</sub>S (Achieved in Practice)

**b. Step 2 - Eliminate technologically infeasible options**

There are no technologically infeasible options to eliminate from step 1.

**c. Step 3 - Rank remaining options by control effectiveness**

- 1) Sulfur Content of fuel gas ≤ 40 ppmv as H<sub>2</sub>S (Achieved in Practice)

**d. Step 4 - Cost Effectiveness Analysis**

The only option listed above has been identified as achieved in practice. Therefore, the option required and is not subject to a cost analysis.

**e. Step 5 - Select BACT**

Pursuant to the above BACT Analysis, BACT for PM<sub>10</sub> emissions from the proposed engines is fuel gas sulfur content not exceeding 40 ppmv as H<sub>2</sub>S. The applicant has proposed to use a biological sulfur removal system and iron sponge and/or carbon canister scrubbers (or an equivalent sulfur removal system) to reduce the sulfur content

of the digester gas combusted in the engines to  $\leq 40$  ppmv as  $H_2S$ . Therefore, the BACT requirements for  $SO_x$  are satisfied.

#### 4. BACT Analysis for VOC Emissions:

##### a. Step 1 - Identify all control technologies

The following options were identified to reduce VOC emissions:

- 1) VOC emissions  $\leq 0.10$  g/bhp-hr (lean burn or equivalent and positive crankcase ventilation) (Achieved in Practice)
- 2) Fuel Cell ( $\leq 0.02$  lb/MW-hr) (Alternate Basic Equipment)

##### b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

##### c. Step 3 - Rank remaining options by control effectiveness

- 1) Fuel Cell ( $\leq 0.02$  lb/MW-hr) (Alternate Basic Equipment)
- 2) VOC emissions  $\leq 0.10$  g/bhp-hr (Achieved in Practice)

##### d. Step 4 - Cost Effectiveness Analysis

###### Option 1: Fuel Cell ( $\leq 0.02$ lb/MW-hr VOC as $CH_4$ ) (Alternate Basic Equipment)

The multi-pollutant cost analysis performed above for the  $NO_x$  and VOC emissions demonstrated that the annualized cost of this alternate option exceeds the Multi Pollutant Cost Effectiveness Threshold calculated for the  $NO_x$  and VOC emission reductions achieved by this technology. Therefore, this option is not cost effective and is being removed from consideration.

###### Option 2: VOC emissions $\leq 0.10$ g/bhp-hr (Achieved in Practice)

This has been identified as achieved in practice and has been proposed by the applicant. Therefore, the option required and is not subject to a cost analysis.

##### e. Step 5 - Select BACT

Pursuant to the above BACT Analysis, BACT for VOC emissions from the proposed engines is VOC emissions  $\leq 0.10$  g/bhp-hr. The applicant has proposed IC engines with VOC emissions  $\leq 0.10$  g/bhp-hr. Therefore, the BACT requirements for VOC are satisfied.

#### 5. BACT Analysis for $NH_3$ Slip Emissions:

A Selective Catalytic Reduction (SCR) system operates as an external control device where flue gases and a reagent (e.g. urea or ammonia) are passed through an appropriate catalyst. The reagent is used to reduce  $NO_x$ , over the catalyst bed, to form elemental

nitrogen, water vapor, and other by-products. The use of a catalyst typically reduces the  $\text{NO}_x$  emissions by up to 90%. Ammonia slip is the result of unreacted ammonia exiting the SCR system.

**a. Step 1 - Identify all control technologies**

The District has not established a cost effectiveness threshold for ammonia. Therefore, only options that are determined to be Achieved-in-Practice controls will be considered for ammonia in this analysis.

District BACT Guideline 3.3.15 lists an ammonia slip emission limit of 10 ppmvd @ 15%  $\text{O}_2$  as an Achieved in Practice BACT requirement for waste gas-fired IC engines.

- 1)  $\text{NH}_3$  emissions  $\leq$  10 ppmvd @ 15%  $\text{O}_2$  (Achieved in Practice)

**b. Step 2 - Eliminate technologically infeasible options**

There are no technologically infeasible options to eliminate from step 1.

**c. Step 3 - Rank remaining options by control effectiveness**

- 1)  $\text{NH}_3$  emissions  $\leq$  10 ppmvd @ 15%  $\text{O}_2$  (Achieved in Practice)

**d. Step 4 - Cost Effectiveness Analysis**

The only option above is achieved in practice and has been proposed by the applicant. Additionally, as stated above, a cost effectiveness threshold for ammonia has not been established by the District. Therefore a cost analysis is not required.

**e. Step 5 - Select BACT**

Pursuant to the above BACT Analysis, BACT for  $\text{NH}_3$  slip emissions from the proposed engines is  $\text{NH}_3$  slip emissions  $\leq$  10 ppmvd @ 15%  $\text{O}_2$ . The applicant has proposed IC engines with  $\text{NH}_3$  slip emissions  $\leq$  10 ppmvd @ 15%  $\text{O}_2$ . Therefore, the BACT requirements for  $\text{NH}_3$  slip are satisfied.

## **APPENDIX C**

### **Summary of Health Risk Assessment (HRA) and Ambient Air Quality Analysis (AAQA)**

# San Joaquin Valley Air Pollution Control District

## \*REVISED\* Risk Management Review

To: Ramon Norman – Permit Services  
 From: Yu Vu – Technical Services  
 Date: October 22, 2015  
 Facility Name: ABEC #3 dba Lakeview Dairy Biogas  
 Location: 17702 Bear Mountain Blvd, Bakersfield, CA 93311  
 at Lakeview Dairy (S-5254)  
 Application #(s): S-8637-2-0, 3-0  
 Project #: S-1143770

### A. RMR SUMMARY

<b>RMR Summary</b>			
<b>Categories</b>	<b>1,468 BHP Bio Gas Engines (Unit 2-0 &amp; 3-0)</b>	<b>Project Totals</b>	<b>Facility Totals</b>
<b>Prioritization Score</b>	107 (ea.)	214	>1
<b>Acute Hazard Index</b>	0.48 (ea.) <sup>1</sup>	0.95	0.95
<b>Chronic Hazard Index</b>	0.16 (ea.)	0.31	0.31
<b>Maximum Individual Cancer Risk (10<sup>-6</sup>)</b>	0.002 (ea.)	0.004	0.004
<b>T-BACT Required?</b>	<b>No</b>		
<b>Special Permit Conditions?</b>	<b>Yes</b>		

<sup>1</sup> H<sub>2</sub>S emissions must be limited in order to achieve the acute hazard index score in this project and for the project to not cause an exceedance of the California Ambient Air Quality Standard (CAAQS). Please see special condition below.

### Proposed Permit Conditions

To ensure that human health risks will not exceed District allowable levels; the following permit conditions must be included for:

#### Unit # 2-0, 3-0

- 1) The H<sub>2</sub>S emissions from the engine shall not exceed 1.97 lbs/hr. as determined by source testing. [District Rule 2201]

## B. RMR REPORT

### I. Project Description

Technical Services received a request on October 7, 2015, to perform a revised Risk Management Review for a proposed installation of two 1,468 BHP Dairy Bio gas-fired full time IC engines. Per the project engineer, the following changes to the project were made in this revision:

- 1) An increase in each engine's rating from 1,412 bhp to 1,468 bhp.
- 2) An increase in digester gas consumption of each engine from 16,303 scf/hr and 142,812,528 scf/yr to 16,327 scf/hr and 143,024,520 scf/yr.
- 3) A change in the stack parameters, resulting in the stack exit velocity of each engine increasing from 19.766 m/s to 23.636 m/s.

### II. Analysis

Technical Services performed a prioritization using the District's HEARTs database. Since the total facility prioritization score was greater than one, a refined health risk assessment was required. Emissions calculated using District approved Dairy Bio Gas emission factors for internal combustion were input into the HEARTs database. The AERMOD model was used, with the parameters outlined below and meteorological data for 2004-2008 from Fellows to determine the dispersion factors (i.e., the predicted concentration or X divided by the normalized source strength or Q) for a receptor grid. These dispersion factors were input into the Hot Spots Analysis and Reporting Program (HARP) risk assessment module to calculate the chronic and acute hazard indices and the carcinogenic risk for the project.

The following parameters were used for the review:

Analysis Parameters Unit 2-0, 3-0			
Source Type	Point	Location Type	Rural
Stack Height (m)	9.144	Closest Receptor (m)	Various
Stack Diameter. (m)	0.4572	Type of Receptor	Business
Stack Exit Velocity (m/s)	23.636	Max Hours per Year	8,760
Stack Exit Temp. (°K)	699.817	Fuel Type	Dairy Bio Gas
BHP	1,468		

Technical Services performed modeling for criteria pollutants CO, NO<sub>x</sub>, SO<sub>x</sub> and PM<sub>10</sub>; as well as a RMR. The emission rates used for criteria pollutant modeling were:

Pollutant	lb/hr	lb/yr
CO	15.6966	50,818
NO <sub>x</sub>	3.2364	4,582.7
SO <sub>x</sub>	0.1295	1,134.0
PM <sub>10</sub>	0.2265	1,984.6
H <sub>2</sub> S	6.0834	N/A

The results from the Criteria Pollutant Modeling are as follows:

### Criteria Pollutant Modeling Results\*

Bio-Gas Engine	1 Hour	3 Hours	8 Hours	24 Hours	Annual
CO	Pass	X	Pass	X	X
NO <sub>x</sub>	Pass <sup>1</sup>	X	X	X	Pass
SO <sub>x</sub>	Pass	Pass	X	Pass	Pass
PM <sub>10</sub>	X	X	X	Pass <sup>2</sup>	Pass <sup>2</sup>
H <sub>2</sub> S	Pass <sup>3</sup>	X	X	X	X

\*Results were taken from the attached PSD spreadsheet.

<sup>1</sup>The project was compared to the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard that became effective on April 12, 2010 using the District's approved procedures.

<sup>2</sup>The criteria pollutants are below EPA's level of significance as found in 40 CFR Part 51.165 (b)(2).

<sup>3</sup>H<sub>2</sub>S emissions must be limited to the value listed in the Proposed Permit Conditions section in order for this project to not cause an exceedance of the California Ambient Air Quality Standard (CAAQS).

### III. Conclusion

The acute and chronic indices are below 1.0 and the cancer risk factor associated with the project is less than 1.0 in a million. **In accordance with the District's Risk Management Policy, the project is approved without Toxic Best Available Control Technology (T-BACT).**

To ensure that human health risks will not exceed District allowable levels; the permit conditions listed on page 1 of this report must be included for this proposed unit.

These conclusions are based on the data provided by the applicant and the project engineer. Therefore, this analysis is valid only as long as the proposed data and parameters do not change.

The emissions from the proposed equipment will not cause or contribute significantly to a violation of the State and National AAQS.

### IV. Attachments

- A. RMR request from the project engineer
- B. Additional information from the applicant/project engineer
- C. Toxic emissions summary
- D. Prioritization score
- E. Facility Summary



**APPENDIX D**  
**Draft ATCs**  
**(S-8637-1-0, -2-0, & -3-0)**

**FOR PROJECT FILE**  
**Emissions Profiles**

San Joaquin Valley  
Air Pollution Control District

## AUTHORITY TO CONSTRUCT

ISSUANCE DATE: DRAFT

PERMIT NO: S-8637-1-0

LEGAL OWNER OR OPERATOR: ABEC #3 LLC DBA LAKEVIEW DAIRY BIOGAS

MAILING ADDRESS: 2828 ROUTH ST, SUITE 500  
DALLAS, TX 75201-1438

LOCATION: 17702 BEAR MOUNTAIN BLVD  
BAKERSFIELD, CA 93311

### EQUIPMENT DESCRIPTION:

ANAEROBIC DIGESTER SYSTEM CONSISTING OF COVERED LAGOON ANAEROBIC DIGESTER CELL(S) WITH PRESSURE/VACUUM VALVE(S) AND AN AIR INJECTION SYSTEM FOR CONTROL OF H<sub>2</sub>S

## CONDITIONS

1. {271} All equipment shall be maintained in good operating condition and shall be operated in a manner to minimize emissions of air contaminants into the atmosphere. [District Rule 2201]
2. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
3. The VOC content of the digester gas produced by the digester system shall not exceed 10% by weight. [District Rule 2201]
4. The digester system cover(s) shall be designed and installed in accordance with Natural Resources Conservation Services (NRCS) Practice Standard Code 367 - Roofs and Covers. [District Rule 2201]
5. The digester system shall be designed to allow gas generated during summer conditions to be stored for more than 24 hours prior to venting in the event that the gas cannot be combusted in digester gas-fired engines or sent to another device with a VOC control efficiency of at least 95% by weight as determined by the APCO. [District Rule 2201]
6. The air injection system shall be maintained and operated in accordance with the supplier's recommendations to minimize the concentration of hydrogen sulfide (H<sub>2</sub>S) in the digester gas. [District Rule 2201]
7. All records shall be maintained and retained for a minimum of five (5) years, and shall be made available for District inspection upon request. All records may be maintained and submitted in an electronic format approved by the District. [District Rules 1070 and 2201]

CONDITIONS CONTINUE ON NEXT PAGE

YOU **MUST** NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Seyed Sadredin, Executive Director, APCO

Arnaud Marjollet, Director of Permit Services

S-8637-1-0, Mar 16 2016 1:06PM - NORMANR - Joint Inspection NOT Required

8. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]

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San Joaquin Valley  
Air Pollution Control District

**AUTHORITY TO CONSTRUCT**

ISSUANCE DATE: DRAFT

**PERMIT NO:** S-8637-2-0

**LEGAL OWNER OR OPERATOR:** ABEC #3 LLC DBA LAKEVIEW DAIRY BIOGAS  
**MAILING ADDRESS:** 2828 ROUTH ST, SUITE 500  
DALLAS, TX 75201-1438

**LOCATION:** 17702 BEAR MOUNTAIN BLVD  
BAKERSFIELD, CA 93311

**EQUIPMENT DESCRIPTION:**

1,468 BHP GE JENBACHER MODEL J 320 GS-C82 (OR DISTRICT APPROVED EQUIVALENT) DIGESTER GAS-FIRED LEAN-BURN IC ENGINE WITH A SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, AND AN IRON SPONGE AND/OR CARBON H<sub>2</sub>S REMOVAL SYSTEM (OR APPROVED EQUIVALENT H<sub>2</sub>S REMOVAL SYSTEM) POWERING AN ELECTRICAL GENERATOR

**CONDITIONS**

1. This facility (Facility S-8637) and the adjacent dairy operation (Facility S-5254) shall be operated as separate stationary sources. [District Rule 2201]
2. All equipment shall be maintained in good operating condition and shall be operated in a manner consistent with good air pollution control practice to minimize emissions of air contaminants. [District Rule 2201]
3. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
4. {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]
5. {15} No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101]
6. {1898} The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction. [District Rule 4102]
7. {4261} This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702]
8. {3203} This engine shall be operated within the ranges that the source testing has shown result in pollution concentrations within the emissions limits as specified on this permit. [District Rule 4702]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director, APCO

Arnaud Marjollet, Director of Permit Services

S-8637-2-0: Mar 16 2016 1:06PM - NORMANR - Joint Inspection NOT Required

9. This engine shall only be fueled with digester gas except in the case that sufficient digester gas is unavailable for the engine at the time that the required one-time initial utility interconnect testing is scheduled. If sufficient digester gas is unavailable for the engine at the time that the required initial utility interconnect testing is scheduled, the engine will be permitted to use sufficient natural gas fuel to complete the required utility interconnect testing. [District Rule 2201]
10. During times this engine is fueled with natural gas for required initial utility interconnect testing, the engine shall continue to comply with all emission standards and limitations contained in this permit. [District Rule 2201]
11. The total amount of electrical energy produced by this engine while fueled on natural gas for required one-time initial utility interconnect testing shall not exceed 96,000 kW-hrs. The following records shall be maintained: 1) date(s) and time(s) that this engine is fueled with natural gas for utility testing, 2) the total amount of electrical energy (kW-hr) produced by this engine when fueled with natural gas for utility testing, and 3) the total number of hours that this engine is fueled with natural gas. [District Rule 2201]
12. The sulfur content of the digester gas used as fuel in this engine shall not exceed 40 ppmv as H<sub>2</sub>S. The applicant may utilize an averaging period of up to 24 hours in length for demonstration of compliance with the fuel sulfur content limit. [District Rules 2201, 4102, 4702, and 4801]
13. This engine shall be equipped with an operational non-resettable elapsed time meter. [District Rules 2201 and 4702]
14. {1897} This engine shall be equipped with either a positive crankcase ventilation (PCV) system that recirculates crankcase emissions into the air intake system for combustion, or a crankcase emissions control device of at least 90% control efficiency. [District Rule 2201]
15. Commissioning activities are defined as, but not limited to, all testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the construction contractor to ensure safe and reliable operation of the reciprocating IC engine, emission control equipment, and associated electrical delivery systems. [District Rule 2201]
16. Commissioning period shall commence when all mechanical, electrical, and control systems are installed and individual system startup has been completed, or when the reciprocating engine is first fired, whichever occurs first. The commissioning period shall terminate when the engine has completed initial performance testing, completed initial engine tuning, and the engine is available for commercial operation. The total duration of the commissioning period for this engine shall not exceed 120 hours of operation. [District Rule 2201]
17. The owner/operator shall minimize the emissions from the engine to the maximum extent possible during the commissioning period. [District Rule 2201]
18. At the earliest feasible opportunity, in accordance with the recommendations of the equipment supplier and/or the construction contractor, the engine shall be tuned to minimize emissions. [District Rule 2201]
19. At the earliest feasible opportunity, in accordance with the recommendations of the equipment supplier and/or the construction contractor, the emission control catalyst system(s) shall be installed, adjusted, and operated to minimize emissions from this unit. [District Rule 2201]
20. The permittee shall submit a summary of activities to be performed during the commissioning period to the District at least two weeks prior to the first firing of this engine. The summary shall include a list of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but are not limited to, the tuning of the engine, the installation and operation of the SCR system, the installation, calibration, and testing of emissions monitors, and any activities requiring the firing of this unit without abatement by the SCR system. [District Rule 2201]
21. During the commissioning period emission rates from this IC engine shall not exceed any of the following limits: 1.0 g-NOx/bhp-hr, 0.07 g-PM<sub>10</sub>/bhp-hr, 4.85 g-CO/bhp-hr, 1.0 g-VOC/bhp-hr. [District Rule 2201]
22. The total number of firing hours of this unit without abatement of emissions by the SCR system shall not exceed 120 hours during the commissioning period. Such operation of this unit without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system. Upon completion of these activities, the unused balance of the 120 firing hours without abatement shall expire. [District Rule 2201]
23. The permittee shall record total operating time of the engine in hours during the commissioning period. [District Rule 2201]

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CONDITIONS CONTINUE ON NEXT PAGE

24. Coincident with the end of the commissioning period, emissions from this IC engine shall not exceed any of the following limits: 0.15 g-NO<sub>x</sub>/bhp-hr (for periodic alternate monitoring, equivalent to 11 ppmvd NO<sub>x</sub> @ 15% O<sub>2</sub>), NO<sub>x</sub> referenced as NO<sub>2</sub>; 0.07 g-PM<sub>10</sub>/bhp-hr; 1.75 g-CO/bhp-hr (for periodic alternate monitoring, equivalent to 210 ppmvd CO @ 15% O<sub>2</sub>); 0.10 g-VOC/bhp-hr (for periodic alternate monitoring, equivalent to 21 ppmvd VOC @ 15% O<sub>2</sub>), VOC referenced as CH<sub>4</sub>. [District Rules 2201 and 4702]
25. The SCR catalyst shall be maintained and replaced in accordance with the recommendations of the catalyst manufacturer or emission control supplier. Records of catalyst maintenance and replacement shall be maintained. [District Rules 2201 and 4702]
26. Ammonia (NH<sub>3</sub>) emissions from this engine shall not exceed 10 ppmvd @ 15% O<sub>2</sub>. [District Rules 2201 and 4102]
27. Source testing to measure NO<sub>x</sub>, CO, VOC, PM<sub>10</sub>, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted within 90 days of initial start-up. [District Rules 1081, 2201, and 4702]
28. Source testing to measure NO<sub>x</sub>, CO, VOC, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted at least once every 24 months. [District Rules 1081, 2201, and 4702]
29. Fuel sulfur content analysis shall be performed within 90 days of initial start-up using EPA Method 11 or EPA Method 15, as appropriate. [District Rules 2201 and 4702]
30. Fuel sulfur content analysis shall be performed at least annually using EPA Method 11 or EPA Method 15, as appropriate. Records of the fuel sulfur analysis shall be maintained and provided to the District upon request. [District Rules 2201 and 4702]
31. {3791} Emissions source testing shall be conducted with the engine operating either at conditions representative of normal operations or conditions specified in the Permit to Operate. [District Rule 4702]
32. For emissions source testing, the arithmetic average of three 30-consecutive-minute test runs shall apply. If two of three runs are above an applicable limit, the test cannot be used to demonstrate compliance with an applicable limit. VOC emissions shall be reported as methane. NO<sub>x</sub>, CO, VOC, and NH<sub>3</sub> concentrations shall be reported in ppmv, corrected to 15% oxygen. [District Rules 2201 and 4702]
33. The following methods shall be used for source testing: NO<sub>x</sub> (ppmv) - EPA Method 7E or ARB Method 100; CO (ppmv) - EPA Method 10 or ARB Method 100; VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100; stack gas oxygen - EPA Method 3 or 3A or ARB Method 100; stack gas velocity - EPA Method 2 or EPA Method 19; stack gas moisture content - EPA Method 4; PM<sub>10</sub> (filterable and condensable) - EPA Method 201 and 202, EPA Method 201a and 202, or ARB Method 5 in combination with Method 501; NH<sub>3</sub> - BAAQMD ST-1B or SCAQMD Method 207-1. Alternative test methods as approved by the District may also be used to address the source testing requirements of this permit. [District Rules 1081 and 4702]
34. The Higher Heating Value (HHV) of the fuel gas shall be determined using ASTM D1826, ASTM 1945 in conjunction with ASTM D3588, or an alternative method approved by the District. [District Rules 2201 and 4702]
35. {109} Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified at least 30 days prior to any compliance source test, and a source test plan must be submitted for approval at least 15 days prior to testing. [District Rule 1081]
36. The results of each source test shall be submitted to the District within 60 days after completion of the source test. [District Rule 1081]
37. The sulfur content of the digester gas used to fuel the engine shall be monitored and recorded at least once every calendar quarter in which a fuel sulfur analysis is not performed. If quarterly monitoring shows a violation of the fuel sulfur content limit of this permit, monthly monitoring will be required until six consecutive months of monitoring show compliance with the fuel sulfur content limit. Once compliance with the fuel sulfur content limit is shown for six consecutive months, then the monitoring frequency may return to quarterly. Monitoring of the sulfur content of the digester gas fuel shall not be required if the engine does not operate during that period. Records of the results of monitoring of the digester gas fuel sulfur content shall be maintained. [District Rule 2201]

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CONDITIONS CONTINUE ON NEXT PAGE

38. Monitoring of the digester gas sulfur content shall be performed using gas detection tubes calibrated for H<sub>2</sub>S; a Testo 350 XL portable emission monitor; a continuous fuel gas monitor that meets the requirements specified in SCAQMD Rule 431.1, Attachment A; District-approved source test methods, including EPA Method 15, ASTM Method D1072, D4084, and D5504; District-approved in-line H<sub>2</sub>S monitors; or an alternative method approved by the District. Prior to utilization of in-line monitors to demonstrate compliance with the digester gas sulfur content limit of this permit, the permittee shall submit details of the proposed monitoring system, including the make, model, and detection limits, to the District and obtain District approval for the proposed monitor(s). [District Rule 2201]
39. The exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods and shall be equipped with safe permanent provisions to sample stack gases with a portable NO<sub>x</sub>, CO, and O<sub>2</sub> analyzer during District inspections. The sampling ports shall be located in accordance with the CARB regulation titled California Air Resources Board Air Monitoring Quality Assurance Volume VI, Standard Operating Procedures for Stationary Emission Monitoring and Testing. [District Rule 1081]
40. The permittee shall monitor and record the stack concentration of NO<sub>x</sub>, CO, and O<sub>2</sub> at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack monitors may be allowed if they satisfy the standards for portable analyzers as specified in District policies and are approved in writing by the APCO.] Monitoring shall be performed not less than once every month for 12 months if two consecutive deviations are observed during quarterly monitoring. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the engine unless monitoring has been performed within the last month if on a monthly monitoring schedule, or within the last quarter if on a quarterly monitoring schedule. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 2201 and 4702]
41. The permittee shall monitor and record the stack concentration of NH<sub>3</sub> at least once every calendar quarter in which a source test is not performed. NH<sub>3</sub> monitoring shall be conducted utilizing District approved gas-detection tubes or a District approved equivalent method. Monitoring shall not be required if the unit is not in operation, i.e. the unit need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the unit unless monitoring has been performed within the last quarter. [District Rules 2201 and 4102]
42. If the NO<sub>x</sub>, CO, or NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, as measured by the portable analyzer or the District-approved ammonia monitoring equipment, exceed the respective permitted emissions concentration(s), the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 8 hours of operation after detection. If the portable analyzer or ammonia monitoring equipment readings continue to exceed the permitted emissions concentration(s) after 8 hours of operation after detection, the permittee shall notify the District within the following 1 hour and conduct a certified source test within 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of the performing the notification and testing required by this condition. [District Rules 2201 and 4702]
43. {3787} All alternate monitoring parameter emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rule 4702]
44. The permittee shall maintain records of: (1) the date and time of NO<sub>x</sub>, CO, O<sub>2</sub>, and NH<sub>3</sub> measurements, (2) the O<sub>2</sub> concentration in percent and the measured NO<sub>x</sub>, CO, and NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, (5) the method of determining the NH<sub>3</sub> emission concentration, and (6) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 2201 and 4702]

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CONDITIONS CONTINUE ON NEXT PAGE



45. Within 90 days of initial start-up, the SCR system reagent injection rate and inlet temperature to the catalyst control system shall be monitored to establish acceptable values and ranges that provide a reasonable assurance of ongoing compliance with the NO<sub>x</sub> emissions limit(s) stated in this permit. Acceptable values and ranges shall be established for each load that the engine is expected to operate at, in a minimum of 10% increments (e.g. 70%, 80%, and 90%). Records of the acceptable SCR system reagent injection rate(s) and inlet temperature(s) to the catalyst control system demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) shall be maintained and made available for inspection upon request. [District Rule 4702]
46. If the SCR system reagent injection rate and/or the inlet temperature to the catalyst control system is outside of the established acceptable range(s), the permittee shall return the SCR system reagent injection rate and inlet temperature to the catalyst control system to within the established acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the SCR system reagent injection rate and inlet temperature to the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of NO<sub>x</sub> and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of NO<sub>x</sub> and O<sub>2</sub> shall continue until the operator can show that the SCR system reagent injection rate and inlet temperature to the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) of this permit. [District Rule 4702]
47. Within 90 days of initial start-up, the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system shall be monitored to establish acceptable values and ranges that provide a reasonable assurance of ongoing compliance with the emissions limit(s) stated in this permit. Acceptable values and ranges shall be established for each load that the engine is expected to operate at, in a minimum of 10% increments (e.g. 70%, 80%, and 90%). Records of the established acceptable inlet temperature and back pressure demonstrated to result in compliance with the CO and VOC emission limits shall be maintained and made available for inspection upon request. [District Rule 4702]
48. If the inlet temperature to the catalyst control system and/or the back pressure of the exhaust upstream of the catalyst control system is outside of the established acceptable range(s), the permittee shall return the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system back to the acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of CO and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of CO and O<sub>2</sub> shall continue until the operator can show that the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the CO emission limit(s) of this permit. [District Rule 4702]
49. The permittee shall monitor and record the engine operating load, the SCR system reagent injection rate, the inlet temperature to the catalyst control system, and the back pressure of the exhaust upstream of the catalyst control system at least once per month. [District Rule 4702]
50. The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: the total hours of operation, the type and quantity of fuel used, maintenance and modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. Quantity of fuel used shall be recorded in standard cubic feet using a non-resettable, totalizing mass or volumetric fuel flow meter or other APCO approved-device. [District Rules 2201 and 4702]
51. {3212} The permittee shall update the I&M plan for this engine prior to any planned change in operation. The permittee must notify the District no later than seven days after changing the I&M plan and must submit an updated I&M plan to the APCO for approval no later than 14 days after the change. The date and time of the change to the I&M plan shall be recorded in the engine's operating log. For modifications, the revised I&M plan shall be submitted to and approved by the APCO prior to issuance of the Permit to Operate. The permittee may request a change to the I&M plan at any time. [District Rule 4702]

52. All records shall be maintained and retained for a minimum of five (5) years, and shall be made available for District inspection upon request. All records may be maintained and submitted in an electronic format approved by the District. [District Rules 2201 and 4702]
53. The permittee shall obtain written District approval for the use of any equivalent control equipment not specifically approved by this Authority to Construct. Approval of the equivalent control equipment shall be made only after the District's determination that the submitted design and performance of the proposed alternate control equipment is equivalent to the specifically authorized equipment. [District Rule 2010]
54. The permittee's request for approval of equivalent equipment shall include the make, model, manufacturer's maximum rating, manufacturer's guaranteed emission rates, equipment drawing(s), and operational characteristics/parameters. [District Rule 2010]
55. Alternate equipment shall be of the same class and category of source as the equipment authorized by the Authority to Construct. [District Rule 2201]
56. No emission factor and no emissions shall be greater for the alternate equipment than for the proposed equipment. No changes in the hours of operation, operating rate, throughput, or firing rate may be authorized for any alternate equipment. [District Rule 2201]

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San Joaquin Valley  
Air Pollution Control District

**AUTHORITY TO CONSTRUCT**

**ISSUANCE DATE: DRAFT**

**PERMIT NO:** S-8637-3-0

**LEGAL OWNER OR OPERATOR:** ABEC #3 LLC DBA LAKEVIEW DAIRY BIOGAS  
**MAILING ADDRESS:** 2828 ROUTH ST, SUITE 500  
DALLAS, TX 75201-1438

**LOCATION:** 17702 BEAR MOUNTAIN BLVD  
BAKERSFIELD, CA 93311

**EQUIPMENT DESCRIPTION:**

1,468 BHP GE JENBACHER MODEL J 320 GS-C82 (OR DISTRICT APPROVED EQUIVALENT) DIGESTER GAS-FIRED LEAN-BURN IC ENGINE WITH A SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, AND AN IRON SPONGE AND/OR CARBON H2S REMOVAL SYSTEM (OR APPROVED EQUIVALENT H2S REMOVAL SYSTEM) POWERING AN ELECTRICAL GENERATOR

**CONDITIONS**

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3. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
4. {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]
5. {15} No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101]
6. {1898} The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction. [District Rule 4102]
7. {4261} This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702]
8. {3203} This engine shall be operated within the ranges that the source testing has shown result in pollution concentrations within the emissions limits as specified on this permit. [District Rule 4702]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

Arnaud Marjollet, Director of Permit Services

S-8637-3-0 Mar 16 2016 1:06PM - NORMANR : Joint Inspection NOT Required

9. This engine shall only be fueled with digester gas except in the case that sufficient digester gas is unavailable for the engine at the time that the required one-time initial utility interconnect testing is scheduled. If sufficient digester gas is unavailable for the engine at the time that the required initial utility interconnect testing is scheduled, the engine will be permitted to use sufficient natural gas fuel to complete the required utility interconnect testing. [District Rule 2201]
10. During times this engine is fueled with natural gas for required initial utility interconnect testing, the engine shall continue to comply with all emission standards and limitations contained in this permit. [District Rule 2201]
11. The total amount of electrical energy produced by this engine while fueled on natural gas for required one-time initial utility interconnect testing shall not exceed 96,000 kW-hrs. The following records shall be maintained: 1) date(s) and time(s) that this engine is fueled with natural gas for utility testing, 2) the total amount of electrical energy (kW-hr) produced by this engine when fueled with natural gas for utility testing, and 3) the total number of hours that this engine is fueled with natural gas. [District Rule 2201]
12. The sulfur content of the digester gas used as fuel in this engine shall not exceed 40 ppmv as H<sub>2</sub>S. The applicant may utilize an averaging period of up to 24 hours in length for demonstration of compliance with the fuel sulfur content limit. [District Rules 2201, 4102, 4702, and 4801]
13. This engine shall be equipped with an operational non-resettable elapsed time meter. [District Rules 2201 and 4702]
14. {1897} This engine shall be equipped with either a positive crankcase ventilation (PCV) system that recirculates crankcase emissions into the air intake system for combustion, or a crankcase emissions control device of at least 90% control efficiency. [District Rule 2201]
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16. Commissioning period shall commence when all mechanical, electrical, and control systems are installed and individual system startup has been completed, or when the reciprocating engine is first fired, whichever occurs first. The commissioning period shall terminate when the engine has completed initial performance testing, completed initial engine tuning, and the engine is available for commercial operation. The total duration of the commissioning period for this engine shall not exceed 120 hours of operation. [District Rule 2201]
17. The owner/operator shall minimize the emissions from the engine to the maximum extent possible during the commissioning period. [District Rule 2201]
18. At the earliest feasible opportunity, in accordance with the recommendations of the equipment supplier and/or the construction contractor, the engine shall be tuned to minimize emissions. [District Rule 2201]
19. At the earliest feasible opportunity, in accordance with the recommendations of the equipment supplier and/or the construction contractor, the emission control catalyst system(s) shall be installed, adjusted, and operated to minimize emissions from this unit. [District Rule 2201]
20. The permittee shall submit a summary of activities to be performed during the commissioning period to the District at least two weeks prior to the first firing of this engine. The summary shall include a list of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but are not limited to, the tuning of the engine, the installation and operation of the SCR system, the installation, calibration, and testing of emissions monitors, and any activities requiring the firing of this unit without abatement by the SCR system. [District Rule 2201]
21. During the commissioning period emission rates from this IC engine shall not exceed any of the following limits: 1.0 g-NO<sub>x</sub>/bhp-hr, 0.07 g-PM<sub>10</sub>/bhp-hr, 4.85 g-CO/bhp-hr, 1.0 g-VOC/bhp-hr. [District Rule 2201]
22. The total number of firing hours of this unit without abatement of emissions by the SCR system shall not exceed 120 hours during the commissioning period. Such operation of this unit without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system. Upon completion of these activities, the unused balance of the 120 firing hours without abatement shall expire. [District Rule 2201]
23. The permittee shall record total operating time of the engine in hours during the commissioning period. [District Rule 2201]

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24. Coincident with the end of the commissioning period, emissions from this IC engine shall not exceed any of the following limits: 0.15 g-NO<sub>x</sub>/bhp-hr (for periodic alternate monitoring, equivalent to 11 ppmvd NO<sub>x</sub> @ 15% O<sub>2</sub>), NO<sub>x</sub> referenced as NO<sub>2</sub>; 0.07 g-PM<sub>10</sub>/bhp-hr; 1.75 g-CO/bhp-hr (for periodic alternate monitoring, equivalent to 210 ppmvd CO @ 15% O<sub>2</sub>); 0.10 g-VOC/bhp-hr (for periodic alternate monitoring, equivalent to 21 ppmvd VOC @ 15% O<sub>2</sub>), VOC referenced as CH<sub>4</sub>. [District Rules 2201 and 4702]
25. The SCR catalyst shall be maintained and replaced in accordance with the recommendations of the catalyst manufacturer or emission control supplier. Records of catalyst maintenance and replacement shall be maintained. [District Rules 2201 and 4702]
26. Ammonia (NH<sub>3</sub>) emissions from this engine shall not exceed 10 ppmvd @ 15% O<sub>2</sub>. [District Rules 2201 and 4102]
27. Source testing to measure NO<sub>x</sub>, CO, VOC, PM<sub>10</sub>, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted within 90 days of initial start-up. [District Rules 1081, 2201, and 4702]
28. Source testing to measure NO<sub>x</sub>, CO, VOC, and ammonia (NH<sub>3</sub>) emissions from this unit shall be conducted at least once every 24 months. [District Rules 1081, 2201, and 4702]
29. Fuel sulfur content analysis shall be performed within 90 days of initial start-up using EPA Method 11 or EPA Method 15, as appropriate. [District Rules 2201 and 4702]
30. Fuel sulfur content analysis shall be performed at least annually using EPA Method 11 or EPA Method 15, as appropriate. Records of the fuel sulfur analysis shall be maintained and provided to the District upon request. [District Rules 2201 and 4702]
31. {3791} Emissions source testing shall be conducted with the engine operating either at conditions representative of normal operations or conditions specified in the Permit to Operate. [District Rule 4702]
32. For emissions source testing, the arithmetic average of three 30-consecutive-minute test runs shall apply. If two of three runs are above an applicable limit, the test cannot be used to demonstrate compliance with an applicable limit. VOC emissions shall be reported as methane. NO<sub>x</sub>, CO, VOC, and NH<sub>3</sub> concentrations shall be reported in ppmv, corrected to 15% oxygen. [District Rules 2201 and 4702]
33. The following methods shall be used for source testing: NO<sub>x</sub> (ppmv) - EPA Method 7E or ARB Method 100; CO (ppmv) - EPA Method 10 or ARB Method 100; VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100; stack gas oxygen - EPA Method 3 or 3A or ARB Method 100; stack gas velocity - EPA Method 2 or EPA Method 19; stack gas moisture content - EPA Method 4; PM<sub>10</sub> (filterable and condensable) - EPA Method 201 and 202, EPA Method 201a and 202, or ARB Method 5 in combination with Method 501; NH<sub>3</sub> - BAAQMD ST-1B or SCAQMD Method 207-1. Alternative test methods as approved by the District may also be used to address the source testing requirements of this permit. [District Rules 1081 and 4702]
34. The Higher Heating Value (HHV) of the fuel gas shall be determined using ASTM D1826, ASTM 1945 in conjunction with ASTM D3588, or an alternative method approved by the District. [District Rules 2201 and 4702]
35. {109} Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified at least 30 days prior to any compliance source test, and a source test plan must be submitted for approval at least 15 days prior to testing. [District Rule 1081]
36. The results of each source test shall be submitted to the District within 60 days after completion of the source test. [District Rule 1081]
37. The sulfur content of the digester gas used to fuel the engine shall be monitored and recorded at least once every calendar quarter in which a fuel sulfur analysis is not performed. If quarterly monitoring shows a violation of the fuel sulfur content limit of this permit, monthly monitoring will be required until six consecutive months of monitoring show compliance with the fuel sulfur content limit. Once compliance with the fuel sulfur content limit is shown for six consecutive months, then the monitoring frequency may return to quarterly. Monitoring of the sulfur content of the digester gas fuel shall not be required if the engine does not operate during that period. Records of the results of monitoring of the digester gas fuel sulfur content shall be maintained. [District Rule 2201]

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38. Monitoring of the digester gas sulfur content shall be performed using gas detection tubes calibrated for H<sub>2</sub>S; a Testo 350 XL portable emission monitor; a continuous fuel gas monitor that meets the requirements specified in SCAQMD Rule 431.1, Attachment A; District-approved source test methods, including EPA Method 15, ASTM Method D1072, D4084, and D5504; District-approved in-line H<sub>2</sub>S monitors; or an alternative method approved by the District. Prior to utilization of in-line monitors to demonstrate compliance with the digester gas sulfur content limit of this permit, the permittee shall submit details of the proposed monitoring system, including the make, model, and detection limits, to the District and obtain District approval for the proposed monitor(s). [District Rule 2201]
39. The exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods and shall be equipped with safe permanent provisions to sample stack gases with a portable NO<sub>x</sub>, CO, and O<sub>2</sub> analyzer during District inspections. The sampling ports shall be located in accordance with the CARB regulation titled California Air Resources Board Air Monitoring Quality Assurance Volume VI, Standard Operating Procedures for Stationary Emission Monitoring and Testing. [District Rule 1081]
40. The permittee shall monitor and record the stack concentration of NO<sub>x</sub>, CO, and O<sub>2</sub> at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack monitors may be allowed if they satisfy the standards for portable analyzers as specified in District policies and are approved in writing by the APCO.] Monitoring shall be performed not less than once every month for 12 months if two consecutive deviations are observed during quarterly monitoring. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the engine unless monitoring has been performed within the last month if on a monthly monitoring schedule, or within the last quarter if on a quarterly monitoring schedule. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 2201 and 4702]
41. The permittee shall monitor and record the stack concentration of NH<sub>3</sub> at least once every calendar quarter in which a source test is not performed. NH<sub>3</sub> monitoring shall be conducted utilizing District approved gas-detection tubes or a District approved equivalent method. Monitoring shall not be required if the unit is not in operation, i.e. the unit need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the unit unless monitoring has been performed within the last quarter. [District Rules 2201 and 4102]
42. If the NO<sub>x</sub>, CO, or NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, as measured by the portable analyzer or the District-approved ammonia monitoring equipment, exceed the respective permitted emissions concentration(s), the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 8 hours of operation after detection. If the portable analyzer or ammonia monitoring equipment readings continue to exceed the permitted emissions concentration(s) after 8 hours of operation after detection, the permittee shall notify the District within the following 1 hour and conduct a certified source test within 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of the performing the notification and testing required by this condition. [District Rules 2201 and 4702]
43. {3787} All alternate monitoring parameter emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rule 4702]
44. The permittee shall maintain records of: (1) the date and time of NO<sub>x</sub>, CO, O<sub>2</sub>, and NH<sub>3</sub> measurements, (2) the O<sub>2</sub> concentration in percent and the measured NO<sub>x</sub>, CO, and NH<sub>3</sub> concentrations corrected to 15% O<sub>2</sub>, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, (5) the method of determining the NH<sub>3</sub> emission concentration, and (6) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 2201 and 4702]

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45. Within 90 days of initial start-up, the SCR system reagent injection rate and inlet temperature to the catalyst control system shall be monitored to establish acceptable values and ranges that provide a reasonable assurance of ongoing compliance with the NO<sub>x</sub> emissions limit(s) stated in this permit. Acceptable values and ranges shall be established for each load that the engine is expected to operate at, in a minimum of 10% increments (e.g. 70%, 80%, and 90%). Records of the acceptable SCR system reagent injection rate(s) and inlet temperature(s) to the catalyst control system demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) shall be maintained and made available for inspection upon request. [District Rule 4702]
46. If the SCR system reagent injection rate and/or the inlet temperature to the catalyst control system is outside of the established acceptable range(s), the permittee shall return the SCR system reagent injection rate and inlet temperature to the catalyst control system to within the established acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the SCR system reagent injection rate and inlet temperature to the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of NO<sub>x</sub> and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of NO<sub>x</sub> and O<sub>2</sub> shall continue until the operator can show that the SCR system reagent injection rate and inlet temperature to the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the NO<sub>x</sub> emission limit(s) of this permit. [District Rule 4702]
47. Within 90 days of initial start-up, the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system shall be monitored to establish acceptable values and ranges that provide a reasonable assurance of ongoing compliance with the emissions limit(s) stated in this permit. Acceptable values and ranges shall be established for each load that the engine is expected to operate at, in a minimum of 10% increments (e.g. 70%, 80%, and 90%). Records of the established acceptable inlet temperature and back pressure demonstrated to result in compliance with the CO and VOC emission limits shall be maintained and made available for inspection upon request. [District Rule 4702]
48. If the inlet temperature to the catalyst control system and/or the back pressure of the exhaust upstream of the catalyst control system is outside of the established acceptable range(s), the permittee shall return the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system back to the acceptable range(s) as soon as possible, but no longer than 8 hours after detection. If the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are not returned to within acceptable range(s) within 8 hours, the permittee shall notify the District within the following 1 hour and begin monitoring and recording the stack concentration of CO and O<sub>2</sub> at least once every month. Monthly monitoring of the stack concentration of CO and O<sub>2</sub> shall continue until the operator can show that the inlet temperature to the catalyst control system and the back pressure of the exhaust upstream of the catalyst control system are operating within the acceptable range(s) demonstrated to result in compliance with the CO emission limit(s) of this permit. [District Rule 4702]
49. The permittee shall monitor and record the engine operating load, the SCR system reagent injection rate, the inlet temperature to the catalyst control system, and the back pressure of the exhaust upstream of the catalyst control system at least once per month. [District Rule 4702]
50. The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: the total hours of operation, the type and quantity of fuel used, maintenance and modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. Quantity of fuel used shall be recorded in standard cubic feet using a non-resettable, totalizing mass or volumetric fuel flow meter or other APCO approved-device. [District Rules 2201 and 4702]
51. {3212} The permittee shall update the I&M plan for this engine prior to any planned change in operation. The permittee must notify the District no later than seven days after changing the I&M plan and must submit an updated I&M plan to the APCO for approval no later than 14 days after the change. The date and time of the change to the I&M plan shall be recorded in the engine's operating log. For modifications, the revised I&M plan shall be submitted to and approved by the APCO prior to issuance of the Permit to Operate. The permittee may request a change to the I&M plan at any time. [District Rule 4702]

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52. All records shall be maintained and retained for a minimum of five (5) years, and shall be made available for District inspection upon request. All records may be maintained and submitted in an electronic format approved by the District. [District Rules 2201 and 4702]
53. The permittee shall obtain written District approval for the use of any equivalent control equipment not specifically approved by this Authority to Construct. Approval of the equivalent control equipment shall be made only after the District's determination that the submitted design and performance of the proposed alternate control equipment is equivalent to the specifically authorized equipment. [District Rule 2010]
54. The permittee's request for approval of equivalent equipment shall include the make, model, manufacturer's maximum rating, manufacturer's guaranteed emission rates, equipment drawing(s), and operational characteristics/parameters. [District Rule 2010]
55. Alternate equipment shall be of the same class and category of source as the equipment authorized by the Authority to Construct. [District Rule 2201]
56. No emission factor and no emissions shall be greater for the alternate equipment than for the proposed equipment. No changes in the hours of operation, operating rate, throughput, or firing rate may be authorized for any alternate equipment. [District Rule 2201]

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