San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

OCT 14 2011

Joseph Demanche
Ameresco Forward LLC
111 Speen Street, Suite 410
Framingham, MA 01701

Re: Notice of Preliminary Decision - Authority to Construct
Project Number: N-1110808

Dear Mr. Demanche:

Enclosed for your review and comment is the District's analysis of Ameresco Forward LLC's application for an Authority to Construct for a landfill gas to energy project consisting of two landfill gas fired internal combustion engines and a siloxane removal system with an enclosed flare, at 9999 South Austin Road in Manteca, CA.

The notice of preliminary decision for this project will be published approximately three days from the date of this letter. Please submit your written comments on this project within the 30-day public comment period which begins on the date of publication of the public notice.

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Mr. James Harader of Permit Services at (209) 557-6445.

Sincerely,

David Warner
Director of Permit Services

DW:JH/st

Enclosures

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
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www.valleyair.org www.healthyairliving.com

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

OCT 14 2011

Mike Tollstrup, Chief
Project Assessment Branch
Stationary Source Division
California Air Resources Board
PO Box 2815
Sacramento, CA 95812-2815

Re: Notice of Preliminary Decision - Authority to Construct
Project Number: N-1110808

Dear Mr. Tollstrup:

Enclosed for your review and comment is the District's analysis of Ameresco Forward LLC's application for an Authority to Construct for a landfill gas to energy project consisting of two landfill gas fired internal combustion engines and a siloxane removal system with an enclosed flare, at 9999 South Austin Road in Manteca, CA.

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Stockton Record
Stockton Record

**NOTICE OF PRELIMINARY DECISION
FOR THE PROPOSED ISSUANCE OF
AN AUTHORITY TO CONSTRUCT**

NOTICE IS HEREBY GIVEN that the San Joaquin Valley Unified Air Pollution Control District solicits public comment on the proposed issuance of Authority to Construct to Ameresco Forward LLC for a landfill gas to energy project consisting of two landfill gas fired internal combustion engines and a siloxane removal system with an enclosed flare, at 9999 South Austin Road in Manteca, CA.

The analysis of the regulatory basis for this proposed action, Project #N-1110808, is available for public inspection at http://www.valleyair.org/notices/public_notices_idx.htm and the District office at the address below. Written comments on this project must be submitted within 30 days of the publication date of this notice to **DAVID WARNER, DIRECTOR OF PERMIT SERVICES, SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT, 4800 ENTERPRISE WAY, MODESTO, CA 95356-0244.**

San Joaquin Valley Air Pollution Control District
Preliminary Review Supplement
Landfill Gas-to-Energy Facility

Facility Name:	Ameresco Forward, LLC	Date:	October 1, 2011
Mailing Address:	111 Speen St., Suite 410 Framingham, MA 01701	Engineer:	James Harader
		Lead Engineer:	Rupi Gill
Contact Person:	Joseph Demanche – Ameresco		
Telephone:	(508) 661-2266		
Application #(s):	N-8569-1-0, '-2-0, and '-3-0		
Project #:	N-1110808		
Deemed Complete:	May 9, 2011		

I. Proposal

Ameresco Forward, LLC ("Ameresco") has applied for Authority to Construct (ATC) permits for three units associated with a landfill gas to energy (LFGTE) facility, to be located on leased property at the Forward Landfill ("Forward"), facility N-339. The LFGTE facility will be owned and operated by Ameresco and will purchase landfill gas (LFG) from Forward in order to use the gas to produce electricity for sale. The LFGTE facility will consist of two LFG-fired internal combustion (IC) engines, each rated at 3,012 bhp and powering an electrical generator. Emissions from these IC engines will be controlled using oxidation catalysts and selective catalytic reduction (SCR) systems, with the exhaust from each engine controlled separately. To enable these catalytic add-on controls to function properly with an acceptable lifespan, the LFG will be routed through a treatment system that will remove siloxanes and various other contaminants from the gas. The treatment system will be of a regenerative type, and the waste gas released by regeneration of the treatment system will be destroyed by an enclosed flare specifically included for that purpose.

Pursuant to Section 3.37 of District Rule 2201, *a Stationary Source is any building, structure, facility, or installation which emits or may emit any affected pollutant directly or as a fugitive emission. Building, structure, facility or installation includes all pollutant emitting activities including emissions units which:*

3.37.1 Are under the same or common ownership or operation, or which are owned or operated by entities which are under common control; and

3.37.2 Belong to the same industrial grouping either by virtue of falling within the same two-digit standard industrial classification code or by virtue of being part of a common industrial process, manufacturing process, or connected process involving a common raw material; and

3.37.3 Are located on one or more contiguous or adjacent properties; or

3.37.4 Are located on one or more properties wholly within either the Western Kern County Oil Fields or the Central Kern County Oil Field or Fresno County Oil Fields and are used for the production of light oil, heavy oil or gas. Notwithstanding the provisions of this definition, light oil production, heavy oil production, and gas production shall constitute separate Stationary Sources.

A. Section 3.37.1 Applicability:

The United States Environmental Protection Agency (EPA) has determined that when one source operation locates on property owned by a second source operation, a presumption of common control exists that must be positively rebutted in order to conclude that the two source operations are at separate stationary sources. This presumption of common control is not rebutted by the fact, which is not in dispute, that no common ownership exists between Ameresco and Republic Services Inc. (Republic) which owns and operates Forward.

EPA has historically recommended that, at minimum, the following questions be addressed in affirming or rebutting the presumption of common control:

- *Do the facilities share common workforces, plant managers, security forces, corporate executive officers, or board of executives?*
  Ameresco has a gas purchase agreement with the Forward Landfill to purchase landfill gas from the landfill as fuel for the LFGTE facility. Ameresco is a separate company that will operate the LFGTE facility independently of the landfill operation with no common employees.

- *Do the facilities share equipment, other property, or pollution control equipment? What does the contract specify with regard to pollution control responsibilities of the contractee? Can the managing entity of one facility make decisions that affect pollution control at the other facility?*
  Forward Landfill owns the LFG collection system and flares which will continue to be operated by the landfill. Ameresco owns the LFG siloxane removal system, the engines and control devices, and the electrical generating equipment. Ameresco also owns the flare used to dispose of the waste gas released from regenerating the LFG treatment system.

- *Do the facilities share common payroll activities, employee benefits, health plans, retirement funds, insurance coverage, or other administrative functions?*
  No.

- *Do the facilities share intermediates, products, byproducts, or other manufacturing equipment? Can the facilities purchase raw materials from and sell products or byproducts to other customers? What are the contractual arrangements for providing goods and services?*
  Ameresco purchases LFG from the Forward Landfill, uses it to fuel IC engines to produce electricity, and then sells the electricity to the local electrical utility. Ameresco does not provide electricity to Forward Landfill. Ameresco has the contractual ability to obtain alternative fuels, such as natural gas or liquefied petroleum gas (LPG), without being required to obtain permission from the Forward Landfill.

- *Who accepts the responsibility for compliance with air quality control requirements?*
  Both Forward Landfill and Ameresco are responsible for their own air quality control requirements. Because Forward Landfill retains the flares, it is quite capable of satisfying its obligation to control LFG without assistance from Ameresco's LFGTE facility.

- *What is the dependency of one facility one the other? If one shuts down, what are the limitations on the other to pursue outside business interests?*
  As mentioned above, although Ameresco proposes to obtain up to 100% of its fuel from the Forward Landfill in the form of LFG, it has proposed to install engines that can be fueled with any gaseous fuel. Furthermore, Ameresco has the contractual right to bring alternative fuels on site and use them in its engines. On the other hand, Forward Landfill is entirely capable of combusting 100% of the LFG in the existing flares, so it is not dependant on Ameresco for LFG control.

- *Does one operation support the operation of the other? What are the financial arrangements of the two entities?*
  Ameresco purchases LFG from the Forward Landfill at a set price. The LFG is then used to fuel engine-driven generators to make electricity, which is sold to the electrical grid. Electricity is not supplied to Forward Landfill. Similarly, revenue from Ameresco is not shared with Forward Landfill; rather, the LFG is purchased at a set price.

As shown in the guidance questions and responses above, Forward Landfill and Ameresco do not share a common control relationship. Ameresco has successfully rebutted the presumption of common control, so Ameresco and Forward do not meet the requirements of Rule 2201 Section 3.37.1 to be considered the same stationary source.

B. Section 3.37.2 Applicability:

Electric, Gas, and Sanitary Services (including landfills and electric energy generation) belong to the same two-digit standard industrial classification code. In addition, the collection of the landfill gas, and the electrical generation produced by combusting the landfill gas in the proposed IC engine are a connected process. Therefore, Forward and Ameresco meet the requirements of Section 3.37.2 of District Rule 2201 to be the same stationary source.

C. Section 3.37.3 Applicability:

Ameresco will be located at Forward. Therefore, Forward and Ameresco meet the requirements of Section 3.37.3 of District Rule 2201 to be the same stationary source.

D. Section 3.37.4 Applicability:

Ameresco will not produce light oil, heavy oil, or gas. Therefore, Ameresco does not meet the requirements of Section 3.37.4.

E. Section 3.37 Applicability:

Since Ameresco and Forward do not meet the requirements of Section 3.37.1 of District Rule 2201, they are not the same stationary source. Ameresco is assigned a separate and distinct facility identification number (N-8569) from Forward, and only emissions from units owned and operated by Ameresco will be considered to contribute to the emissions from the Ameresco Forward LLC stationary source.

II. Rules

Rule 2201 New and Modified Stationary Source Review Rule (4/21/11)
Rule 2520 Federally Mandated Operating Permits (6/21/01)
Rule 4001 New Source Performance Standards (4/14/99)
Rule 4002 National Emission Standards for Hazardous Air Pollutants (5/20/04)
Rule 4101 Visible Emissions (2/17/05)
Rule 4102 Nuisance (12/17/92)
Rule 4201 Particulate Matter Concentration (12/17/92)
Rule 4311 Flares (6/18/09)
Rule 4701 Stationary Internal Combustion Engines – Phase 1 (8/21/03)
Rule 4702 Stationary Internal Combustion Engines – Phase 2 (8/18/11)
Rule 4801 Sulfur Compounds (12/17/92)
CH&SC 41700 Health Risk Assessment
CH&SC 42301.6 School Notification
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. Location

Ameresco will be located at 9999 S. Austin Rd in Manteca, CA. The District has determined that this facility is not within 1,000 feet of the outer boundary of the nearest K-12 school. Therefore, the school notification requirements of California Health & Safety Code 42301.6 do not apply to this proposal.

IV. Process Description

Ameresco will use the landfill gas-fired IC engines to power generators that will produce electrical power to be added to the local power grid.

Landfill gas production results from chemical reactions and microbes acting upon the landfill waste as materials in a landfill begin to break down. As the landfill gas continues to be produced, pressure in the landfill begins to grow causing the gas to migrate to the surface of the landfill and be released into the atmosphere. Uncontrolled emissions of landfill gasses have resulted in explosions and fires at landfills, notably in Atlanta, Georgia in 1967 and in Winston-Salem, North Carolina in 1969. In addition, the migration of subsurface gasses has resulted in the contamination of ground water at some landfill sites. To address and prevent these common problems, landfill operations have more recently drilled wells into landfills, captured the LFG, and burned it in a flare in a safe and controlled manner. As an alternative, landfill operations have begun to burn the landfill gas in internal combustion (IC) engines driving electrical generators used to provide electrical power to onsite and offsite operations. Ameresco will purchase landfill gas from the landfill and combust the LFG in two identical 3,012 bhp IC engines, each connected to a 2,175 kW electrical generator. Each engine is also equipped with an oxidation catalyst and an SCR system as add-on pollution controls.

Naturally occurring landfill gas ideally has a composition of 55% methane and 45% carbon dioxide. However, landfill management techniques can considerably affect the concentration of methane and carbon dioxide in the gas. In practice, a typical landfill gas will have a composition of 45-50% methane, 35-45% carbon dioxide, 0-2 % oxygen, 1-15% nitrogen, and trace amounts of other compounds. Landfill gas collection systems are normally equipped with a pump used to pull the gas from the landfill. As a result, a negative pressure on the landfill can result in ambient air migrating into the top and perimeter of the landfill, supplying oxygen and nitrogen to the landfill gas. Typically, oxygen levels greater than 2% cause methane production to drop considerably. However, a landfill operator may use the introduction of air into the landfill to control excessive odors or keep landfill gas from migrating into areas around the landfill. With good landfill collection practices, landfill gas with can be obtained with stable methane content in the range between 50-55%.

One of the difficulties associated with LFGTE projects is the presence of siloxanes[1] and other contaminants in the LFG. While these contaminants are only present in trace concentrations, the potential impact on project viability can be considerable. In particular, combustion of siloxane-contaminated LFG produces silica fumes and hot silica dust, which tends to condense as silicates on any available surface. Silicates condensing on engine surfaces lead to dramatically increased wear and maintenance requirements, while silicates condensing after the engine can potentially coat and blind or poison the catalyst in a catalytic pollution control device, leading to substantial or complete failure of the control device long before the normal expected time of replacement.

[1] Siloxanes are a class of silicone-containing organic compounds frequently found in LFG. The silicone is generally ascribed to increased use of silicone compounds in consumer products. To be clear, silicone is a polymer of alternating silicon and oxygen atoms with properties determined by the organic compound(s) connected to the silicon atoms.

To minimize the destructive effects of siloxanes in the LFG, operators have begun installing LFG treatment systems designed to remove siloxanes. Ameresco proposes to install a two-stage system employing two parallel adsorption canisters and a fixed-bed polishing system for additional siloxane removal. The canisters will operate in parallel, meaning that one will be treating the LFG while the other is being regenerated. Regeneration involves heating the canister to a temperature at which the siloxanes and other contaminants, including VOC, that have adsorbed into the silica gel revolatilize and are drawn off by the waste gas flare blower. The flare combusts the waste gas along with a stream of raw LFG as supplemental fuel; the combination is combusted at a temperature sufficient to ensure destruction of the air pollutants in the waste gas. Since the flare serves to destroy VOC, siloxanes, and other contaminants in the waste gas, it is an air pollution abatement device.

Forward is currently permitted to burn the landfill gas in an existing flare. During periods of high landfill gas production, low engine demand, or engine maintenance, the engines may not be capable of consuming all of the landfill gas recovered. Therefore, Forward is not proposing to remove the flare or modify its permit at this time.

V. Equipment Listing

Pre-Project Equipment Description:
Since these are all new emission units there is no pre-project equipment to describe.

Post-Project Equipment Description:

N-8569-1-0: 3,012 BHP GE ENERGY MODEL JGS616 LANDFILL GAS-FIRED LEAN BURN IC ENGINE POWERING A 2,175 KW ELECTRICAL GENERATOR AND SERVED BY A SILOXANE REMOVAL SYSTEM (SHARED WITH PERMIT UNIT N-8569-2-0), AN OXIDATION CATALYST, AND A SELECTIVE CATALYTIC REDUCTION SYSTEM

N-8569-2-0: 3,012 BHP GE ENERGY MODEL JGS616 LANDFILL GAS-FIRED LEAN BURN IC ENGINE POWERING A 2,175 KW ELECTRICAL GENERATOR AND SERVED BY A SILOXANE REMOVAL SYSTEM (SHARED WITH PERMIT UNIT N-8569-1), AN OXIDATION CATALYST, AND A SELECTIVE CATALYTIC REDUCTION SYSTEM

N-8569-3-0: SILOXANE REMOVAL SYSTEM SERVED BY A 5.64 MMBTU/HR ABUTEC MODEL HTF WASTE GAS-FIRED FLARE

VI. Emission Control Technology Evaluation

IC engines such as the ones proposed by Ameresco emit many pollutants, including oxides of nitrogen (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC). CO and VOC emissions are generally the result of incomplete combustion in the engine, while NO_x emissions result either from the oxidation of nitrogen in the fuel supply ("fuel NO_x") or from the oxidation of nitrogen gas in the combustion air ("thermal NO_x"). With LFG there is little or no fuel-bound nitrogen to produce fuel NO_x, so essentially all NO_x emissions are thermal NO_x.

Thermal NO_x production is based on several factors, including peak combustion temperature and residence time at the peak temperature. Lean-burn engines such as those proposed by Ameresco reduce NO_x emissions by running in a fuel-lean state which reduces the peak combustion temperature and associated NO_x emissions. A variety of other engine design elements allow for good combustion efficiency despite the lower peak combustion temperature, reducing emissions of CO and VOC.

IC engines are also potential sources of PM_{10} and SO_x emissions, although engines running on gaseous fuels generally have minimal emissions of both. LFG-fired engines, however, can have greater SO_x and PM_{10} emissions than a comparable natural gas-fired engine because of the presence of siloxanes and hydrogen sulfide (H_2S) in the LFG. Combustion of H_2S results in SO_x emissions directly proportional to the concentration of H_2S; when SO_x control is required it is typically implemented by scrubbing H_2S from the LFG before combustion. However, landfills generally do not produce gases with H_2S concentrations sufficiently high to require pretreatment. For example, while a wastewater treatment plant digester might produce gas with an H_2S concentration of 1,000 – 3,000 ppmv, the H_2S concentration in LFG is commonly an order of magnitude lower.

Siloxanes are organic silicone compounds that, when combusted, produce silica particulate that can coat surfaces exposed to the exhaust gas and contribute to PM_{10} emissions. These PM_{10} emissions have not historically been controlled in LFG-fired engines, either through pretreatment of the LFG to remove siloxanes or through add-on controls; instead, operators have accepted that LFG-fired engines will experience greater wear and require more frequent maintenance than engines using other gaseous fuels.

Ameresco has proposed to control NO_x emissions by the use of an SCR system for each engine. In this system, urea or ammonia is injected into the exhaust gas using one or more injection nozzles. The exhaust gas then passes through a catalyst, which allows the ammonia or urea to reduce the NO_x molecules to gaseous nitrogen and water at temperatures in the range of 480 – 800 °F.

Upstream of the SCR system, the exhaust gas will pass through an oxidation catalyst to oxidize CO and VOC to CO_2 and gaseous hydrogen. This sort of two-way catalyst is distinct from the three-way catalysts common for rich-burn IC engines in that it does not control NO_x in addition to CO and VOC. Ameresco has proposed the oxidation catalyst both as a mechanism for reducing CO and VOC emissions and as a mechanism to reduce silica fouling of the SCR catalyst downstream of the oxidation catalyst. Since the later is sturdier and more robust, it is expected to endure cleaning better and with less degradation than the SCR catalyst would, while the lower price of the oxidation catalyst compared with the SCR catalyst makes sacrificial use of the oxidation catalyst acceptable compared with the alternative of using the SCR alone without the protection of the oxidation catalyst.

VII. General Calculations

A. Assumptions

- Engine operation is 24 hr/day, 365 day/yr
- LFG HHV is 525 Btu/ft^3 (same as for project N-1103269, Amaresco Foothill)
- Engine LFG flow rate is 942 ft^3/min (applicant)
- Flare LFG flow rate is 200 ft^3/min (applicant)
- LFG F-Factor is 9,399 ft^3/MMBtu (same as for project N-1103269, Amaresco Foothill)
- Maximum LFG Exhaust Rate from engine is 5,565 SCFM at 10% O_2 (applicant)
- Engine brake-specific fuel consumption is 5,987 Btu/bhp-hr (Engine Manufacturer)
- Facility-wide VOC emissions shall not exceed 19,999 lb/yr (applicant)
- Facility-wide CO emissions shall not exceed 199,999 lb/yr (applicant)
- Other assumptions stated when made

B. Emission Factors

Ameresco has proposed the emission factors specified in the following table for the IC engines, after taking into consideration the effects of the add-on pollution controls.

IC Engine Emission Factors		
Pollutant	Proposed EF	Source
NO_x	0.15 g/bhp-hr	Applicant
SO_x	150 ppmv influent H_2S	Applicant
PM_{10}	0.05 g/bhp-hr	Applicant
CO	1.8 g/bhp-hr	Applicant
VOC	0.20 g/bhp-hr	BACT
NH_3	15 ppmv @ 15% O_2	Applicant

SO_x is proposed as 150 ppmv as H_2S in the LFG. Since actual H_2S concentration in the LFG is around 46.9 ppmv based on data from Forward, there is adequate margin for compliance. SO_x emissions will be calculated directly from the LFG H_2S content.

Ameresco proposed a VOC limit of 20 ppmv as hexane @ 3% O_2 or 98% destruction efficiency based on the requirements of the landfill new source performance standard (NSPS). While the emission limit allows for calculation of the potential emissions, the alternative destruction efficiency requirement imposes no upper limit on emissions. For example, the default VOC concentration for LFG in the NSPS is 4,000 ppmv as hexane, which would result in an effluent concentration of 80 ppmv. Potential emission calculations must establish a firm upper limit on the potential emissions from any source operation; so the proposed limit does not satisfy the requirements for establishing the potential to emit.

The District has determined that the achieved-in-practice best available control technology for this type of source operation is a combined emission limit incorporating both compliance with the NSPS requirements and a firm emission limit. The emission limit, which cannot be exceeded under any circumstances, is 0.20 g/bhp-hr, which will be used to calculated potential emissions from these engines.

Ammonia (NH_3) emissions are an unavoidable element of the SCR system, since it is impossible to ensure all the urea or ammonia injected into the exhaust stream reacts with NO_x. Therefore, some quantity of ammonia "slip" is an unavoidable consequence of the SCR system. Ammonia emissions can also be calculated directly from the slip limit.

Ameresco has also proposed the worst-case emission factors specified in the following table for the flare. The proposed VOC emission factor ensures that VOC emissions from the siloxane removal system are sufficiently controlled by the flare to avoid violations of the landfill new source performance standard.

Flare Emission Factors		
Pollutant	Proposed EF	Source
NO_x	0.041 lb/MMBtu	Applicant
SO_x	150 ppmv	Applicant
PM_{10}	0.20 lb/MMBtu	Applicant, worst-case
CO	0.20 lb/MMBtu	Applicant
VOC	0.14 lb/MMBtu	EPA document AP-42

Ameresco also proposed that the flare emissions be limited to 20 ppmv as hexane at 3% O_2 or 98% VOC destruction efficiency. However, as with the engines, these alternatives impose no upper limit on potential emissions. Therefore, a not-to-exceed emission factor from EPA Document AP-42 will be used to calculate potential flare emissions.

C. Emission Calculations

1. Pre-Project Potential to Emit (PE1)

Since these are all new emission units, PE1 is zero for all pollutants.

2. Post-Project Potential to Emit (PE2)

Since the engines are identical, the potential emissions will be identical.

N-8569-1-0, '-2-0 (LFG-Fired IC Engines):

The proposed engines use SCR to achieve compliance with the 0.15 g/bhp-hr emission limit for NO_x. While emission units equipped with SCR commonly require a less stringent emission limit when starting up, reflecting the time required for the SCR to reach operational temperature, Ameresco has proposed that no express startup emission limit is required. The time to reach operational temperature from a cold

startup is approximately 20 minutes, during which time the engine is operating a much less than full load. In previous testing of NO_x emissions on a smaller engine from the same manufacturer, Ameresco determined that the mass emission rate (on a lb/hr basis) did not exceed the mass emission limit for the engine operating at full load. Ameresco expects the proposed engines to display a similar consistency in emissions during the brief startup period. Therefore, it is expected that startup operations will not result in an exceedance of the potential daily emissions calculated below.

$PE2_{NOx}$ = (0.15 g/bhp-hr) x (3,012 bhp) x (24 hr/day) ÷ (453.6 g/lb) = 23.9 lb/day
$PE2_{NOx}$ = (23.9 lb/day) x (365 day/yr) = 8,724 lb/yr

$PE2_{PM10}$ = (0.05 g/bhp-hr) x (3,012 bhp) x (24 hr/day) ÷ (453.6 g/lb) = 8.0 lb/day
$PE2_{PM10}$ = (11.2 lb/day) x (365 day/yr) = 2,920 lb/yr

$PE2_{CO}$ = (1.8 g/bhp-hr) x (3,012 bhp) x (24 hr/day) ÷ (453.6 g/lb) = 286.9 lb/day
$PE2_{CO}$ = (286.9 lb/day) x (365 day/yr) = 104,719 lb/yr

$PE2_{VOC}$ = (0.20 g/bhp-hr) x (3,012 bhp) x (24 hr/day) ÷ (453.6 g/lb) = 31.9 lb/day
$PE2_{VOC}$ = (31.9 lb/day) x (365 day/yr) = 11,644 lb/yr

$PE2_{NH3}$ = $(15/10^6)$ x (1 lb-mol/379.5 ft^3) x (17 lb/lb-mol) x (5,655 ft^3/min) x (60 min/hr) x (24 hr/day) x ((20.95 – 10.00) ÷ (20.95 – 15.00))
$PE2_{NH3}$ = 10.1 lb/day
$PE2_{NH3}$ = (10.1 lb/day) x (365 day/yr) = 3,687 lb/yr

N-8569-3-0 (Waste-Gas Flare):

$PE2_{NOx}$ = (0.041 lb/MMBtu) x (5.64 MMBtu/hr) x (24 hr/day) = 5.5 lb/day
$PE2_{NOx}$ = (5.5 lb/day) x (365 day/yr) = 2,008 lb/yr

$PE2_{PM10}$ = (0.20 lb/MMBtu) x (5.64 MMBtu/hr) x (24 hr/day) = 27.1 lb/day
$PE2_{PM10}$ = (27.1 lb/day) x (365 day/yr) = 9,892 lb/yr

$PE2_{CO}$ = (0.20 lb/MMBtu) x (5.64 MMBtu/hr) x (24 hr/day) = 27.1 lb/day
$PE2_{CO}$ = (27.1 lb/day) x (365 day/yr) = 9,892 lb/yr

$PE2_{VOC}$ = (0.14 lb/MMBtu) x (5.64 MMBtu/hr) x (24 hr/day) = 19.0 lb/day
$PE2_{VOC}$ = (19.0 lb/day) x (365 day/yr) = 6,935 lb/yr

N-8569-1-0, '-2-0, '-3-0:

When calculating SO_x emissions, it is assumed that all of the collected LFG, with the specified concentration of H_2S, is routed to a single engine or to the flare. The total LFG flow rate assumes 942 ft^3/min for each engine and 200 ft^3/min for the flare, for a total of 2,084 ft^3/min. Note that this calculation actually produces the maximum capacity to emit SO_x from the entire LFGTE facility. To provide for operational

flexibility for the various emission units, the potential emissions calculated below will be ascribed to each engine and to the flare, because any one of these emission units could emit all of the SO_x, but no combination of these emission units could emit more than this amount.

PE_{SOx} = (150/10^6) x (1 lb-mol/379.5 ft^3) x (1 SO_2/H_2S) x (64 lb/lb-mol) x (2,084 ft^3/min) x (60 min/hr) x (24 hr/day)
$PE2_{SOx}$ = 75.9 lb/day
$PE2_{SOx}$ = (75.9 lb/day) x (365 day/yr) = 27,704 lb/yr

Potential emissions are summarized in the below table:

Post-Project Potential to Emit (PE2)			
Unit	Pollutant	PE2 (lb/day)	PE2 (lb/yr)
N-8569-1-0	NO_x	23.9	8,724
	SO_x	75.9	27,704
	PM_{10}	8.0	2,920
	CO	286.9	104,719
	VOC	31.9	11,644
	NH_3	10.1	3,687
N-8569-2-0	NO_x	23.9	8,724
	SO_x	75.9	27,704
	PM_{10}	8.0	2,920
	CO	286.9	104,719
	VOC	31.9	11,644
	NH_3	10.1	3,687
N-8569-3-0	NO_x	5.5	2,008
	SO_x	75.9	27,704
	PM_{10}	27.1	9,892
	CO	27.1	9,892
	VOC	19.0	6,935

3. Quarterly Net Emissions Change (QNEC)

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

D. Stationary Source Calculations

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

Pursuant to Section 4.9 of District Rule 2201, the Pre-Project Stationary Source Potential to Emit (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 that have occurred at the source, and which have not been used on-site.

Since the Ameresco LFGTE facility is an entirely new stationary source, SSPE1 is zero for all pollutants.

2. Post-Project Stationary Source Potential ~~to Emit~~ (SSPE2)

Pursuant to Section 4.10 of District Rule 2201, the Post Project Stationary Source Potential to Emit (SSPE2) 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 that have occurred at the source, and which have not been used on-site.

As previously noted, the facility-wide VOC emissions are limited to no more than 19,999 lb/yr and CO emissions are likewise limited to 199,999 lb/yr. Ameresco proposed these specific limiting condition (SLCs) in order to ensure the facility will not exceed the major source and offset thresholds for VOC or CO. In addition, the potential emissions previously calculated for SO_x actually represent the site-wide potential emissions, since SO_x emissions are dependant on the H_2S content of the LFG. Only a limited amount of LFG and associated H_2S comes on-site in any given day or year, so SO_x are emissions are likewise limited no matter which emission unit, or combination of units, burns the H_2S and emits the resulting SO_x.

SSPE2 (lb/yr)					
	NO_x	SO_x	PM_{10}	CO	VOC
N-8569-1-0	8,724	27,704	2,920	199,999	19,999
N-8569-2-0	8,724		2,920		
N-8569-3-0	2,008		9,892		
SSPE2	19,456	27,704	15,732	199,999	19,999

3. Major Source Determination

Pursuant to Section 3.23 of District Rule 2201, a Major Source is a stationary source with post-project emissions, or SSPE2 equal to or exceeding one or more of the following threshold values. However, Section 3.23.2 states, "for the purposes of determining major source status, the SSPE2 shall not include the quantity of emission reduction credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions that have occurred at the source, and which have not been used on-site."

Major Source Determination (lb/yr)					
	NO_x	SO_x	PM_{10}	CO	VOC
SSPE2	19,456	27,704	15,732	199,999	19,999
Major Source Threshold	20,000	140,000	140,000	200,000	20,000
Major Source?	No	No	No	No	No

As shown in the above table, Ameresco will not be a major source for any pollutant.

Additionally, a major source of $PM_{2.5}$ is defined as one with the potential to emit 100 ton/yr (200,000 lb/yr) or more of $PM_{2.5}$. Since $PM_{2.5}$ is a subset of PM_{10}, it is evident that SSPE2 for $PM_{2.5}$ emissions is less than or equal to 100 tons/yr; thus, this facility is not a major source for $PM_{2.5}$.

4. Baseline Emissions

Pursuant to District Rule 2201, Section 3.7, BE for any pollutant is equal to the pre-project potential to emit for any emissions unit located at a non-major source. For an emission unit at a major source, BE is equal to the historical actual emissions for that emission unit. However, for a new emission unit both HAE and PE1 are zero.

5. SB288 Major Modification

An SB288 Major Modification is defined in 40 CFR Part 51.165 (in effect on December 19, 2002) 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.*" As shown in Section VII.D.3, Ameresco is not a major source for any pollutant, and therefore cannot undergo an SB288 major modification. No further discussion is required.

6. Federal Major Modification

Section 3.17 of Rule 2201 specifies that a major modification is as defined in 40 CFR 51.165 and Part D of Title I of the Clean Air act. These provisions define a major modification as a significant increase in emissions at a major stationary source. As shown in Section VII.D.3 of this document, Ameresco will not be a major source for any pollutant, and therefore cannot undergo a federal major modification. No further discussion is required.

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 for the following[2]:

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 SB288 Major Modification or a Federal Major Modification.

As shown in Section VII.C.2, the engines each have potential emissions in excess of 2.0 lb/day for each pollutant. However, SSPE2 for CO does not exceed 200,000 lb/yr, so BACT is not triggered for CO.

Permit unit N-8569-3-0 is for a siloxane removal system served by a flare. It is clear that the flare is an air pollution abatement device, serving to destroy siloxanes, VOC, and other contaminants in the waste gas. BACT is triggered on an emission unit-by-emission unit basis, but since the concept of an emission unit includes a source operation, while the definition of a source operation specifically excludes an air pollution abatement operation, BACT can only be triggered for the emissions unit itself and not by an air pollution abatement device. The siloxane removal system has the potential to emit 14.8 pounds of VOC in any one day even after the control device. Therefore, BACT is triggered for VOC, but cannot be triggered for NO_x, SO_x, PM_{10}, and CO because those pollutants are byproducts of the air pollution abatement device (the flare). While the siloxane removal system also has the potential to emit sulfur compounds, siloxanes,

[2] 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.

and various other contaminants, none of these are classified as affected pollutants under District Rule 2201, so BACT is not required for these pollutants under the rule.

2. BACT Guideline

A recent BACT Analysis for waste gas-fired engines was prepared in District Project N-1103269. A copy of the BACT Clearinghouse page, prepared in District Project N-1103269, is included in Appendix B.

A recent BACT Analysis for emissions from a siloxane removal system flare was prepared in District Project N-1103269. The control requirements used in that analysis will be considered in this project. The siloxane removal flare analysis in District Project N-1103269 did not include a draft BACT Clearinghouse page; therefore, a clearinghouse page is not included in the Appendix.

3. BACT Determination

As shown by the Top-Down BACT determinations presented in Appendix B and Appendix C, BACT is satisfied by the following:

N-8569-1-0, '-2-0 (LFG-Fired IC Engines):
- NO_x: 0.15 g/bhp-hr
- SO_x: LFG H_2S content of 150 ppmv
- PM_{10}: 0.05 g/bhp-hr
- VOC: 0.20 g/bhp-hr

N-8569-3-0 (Waste Gas-Fired Flare):
- VOC: 98% control efficiency or VOC emissions of 20 ppmvd (as hexane) @ 3% O_2

B. Offsets

1. Offset Applicability

Pursuant to Section 4.5.3 of the rule, emission offsets are required if SSPE2 equals or exceeds the following emission offset threshold levels for any one affected pollutant:

Emission Offset Thresholds (lb/yr)					
	NO_x	SO_x	PM_{10}	CO	VOC
SSPE1	0	0	0	0	0
SSPE2	19,456	27,704	15,732	199,999	19,999
Offset Threshold	20,000	54,750	29,200	200,000	20,000
Offsets Triggered?	No	No	No	No	No

As shown in the above table, offsets are not required for any pollutant.

2. Quantity of Offsets Required

Offsets are not required for this proposal. No further discussion is required.

C. Public Notice

1. Applicability

Pursuant to Section 5.4 of the rule, public notification and publication are required for the following types of applications:

5.4.1 New Major Sources, Federal Major Modifications, and SB288 Major Modifications
As shown in Section I, Ameresco is a new stationary source. As shown in Section VII.D.3, Ameresco is not a major source for emissions of any pollutant. Public notification is not required under this provision.

5.4.2 Applications which include a new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one affected pollutant
As shown in Section VII.C.2, each engine has the potential to emit CO in excess of 100 pounds in any one day. Public notification is required under this provision.

5.4.3 Modifications that increase SSPE1 from a level below the emissions offset threshold level to a level exceeding the emissions offset threshold level for one or more pollutants
This proposal is for a new stationary source rather than a modification of an existing stationary source. Public notification is not required under this provision.

5.4.4 New stationary sources with SSPE2 exceeding the emissions offset threshold level for one or more pollutants
As shown earlier in this evaluation, SSPE2 does not exceed the offset threshold level for any pollutant. Public notification is not required under this provision.

5.4.5 Any permitting action resulting in a Stationary Source Project Increase in Permitted Emissions (SSIPE) exceeding 20,000 pounds per year for any one pollutant

	SSIPE (lb/yr)				
	NO_x	SO_x	PM_{10}	CO	VOC
SSPE2	19,456	27,704	15,753	199,999	19,999
SSPE1	0	0	0	0	0
SSIPE = SSPE2 – SSPE1	19,456	27,704	15,753	199,999	19,999
SSIPE > 20,000?	No	Yes	No	Yes	No

As shown in the above table, SSIPE exceeds 20,000 lb/yr for SO_x and CO. Public notification is required under this provision.

2. Public Notice Action

As shown above, public notification is required under several provision of Rule 2201, Section 5.4. Therefore, public notice documents will be submitted to the California Air Resources Board (CARB) 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 Limitation (DEL)

Daily Emissions Limitations (DELs) and other enforceable conditions are required by Section 3.15 to restrict a unit's maximum daily emissions to a level at or below the emissions associated with the maximum design capacity. Per Sections 3.15.1 and 3.15.2, the DEL must be contained in the latest ATC and contained in or enforced by the latest PTO, and enforceable, in a practical manner, on a daily basis. DELs are also required to enforce the applicability of BACT. The following conditions will be included on the ATCs:

N-8569-1-0, '-2-0 (LFG-Fired IC Engines):

- *This engine shall be fired exclusively with landfill gas. [District Rule 2201]*
- *Emissions from this landfill gas-fired engine shall not exceed 0.15 g-NOx/bhp-hr, 0.05 g-PM10/bhp-hr, 1.8 g-CO/bhp-hr, 0.20 g-VOC/bhp-hr, and 15 ppmvd NH3 at 15% O2. [District Rules 2201 and 4102]*

N-8569-3-0 (Waste gas-fired flare):

- *This flare shall be fired with waste gas from the siloxane removal system, with landfill gas as supplemental fuel and propane for startup. [District Rule 2201]*
- *Emissions from this waste gas-fired flare shall not exceed 0.041 lb-NOx/MMBtu, 0.20 lb-PM10/MMBtu, 0.20 lb-CO/MMBtu, and 0.14 lb-VOC/MMBtu. [District Rule 2201]*

The DEL for SO_x must, as explained in Section VII.C.2 of this document, reflect the facility-wide potential for SO_x emissions. In addition, Ameresco has proposed specific limiting conditions for both VOC and CO. These conditions will limit the potential emissions of CO and VOC from all emission units at this stationary source.

N-8569-1-0, '-2-0, '-3-0:

- *The concentration of sulfur compounds in the landfill gas entering this stationary source shall not exceed 150 ppmvd as H2S. [District Rule 2201]*
- *The landfill gas flow rate to this stationary source shall not exceed 2,084 scf/min. [District Rule 2201]*
- *CO emissions from this stationary source shall not exceed 199,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]*

- *VOC emissions from this stationary source shall not exceed 19,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]*

E. Compliance Assurance

1. Source Testing

The engines associated with this proposal are subject to District Rule 4702, which specifies source testing requirements for these units. Therefore, the source testing requirements shall be discussed in the portions of this document devoted to the applicable rule.

The waste gas-fired flare is exempt from the requirements of District Rule 4311 (Flares). However, the flare is an air pollution abatement device for controlling VOC and other contaminant emissions from the siloxane removal system. Pursuant to SSP-1705, *Source Testing Frequency*, testing to demonstrate compliance with the VOC control efficiency requirement or emission limit is required upon initial startup and annually thereafter. In addition, source test data for both VOC and CO is required to enable accurate documentation of compliance with the specific limiting conditions for those pollutants. The following conditions will be included on the ATC:

- *Source testing to measure the VOC and CO emission concentrations, and NMOC emissions and destruction efficiency, shall be conducted within 90 days of initial startup and annually thereafter. [District Rule 2201]*

- *Source testing shall be conducted using EPA Method 25, 25C, or 18 (for VOC concentration), EPA Method 10 or 10B or ARB Method 100 (for CO concentration), EPA Method 3 or 3A (for oxygen concentration), and NMOC (ppmv) - EPA Method 18, 25, 25A, or 25C. [District Rule 2201]*

- *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 thereafter. [District Rule 1081]*

2. Monitoring

The engines associated with this proposal are subject to District Rule 4702, which specifies monitoring requirements for these units. In addition, the flare is subject to District Rule 4311, which specifies monitoring requirements for this unit. Therefore, these monitoring requirements shall be discussed in the portions of this document devoted to the applicable rules.

In addition, this facility is subject to a fuel sulfur content limit and resulting SO_x emission limit. LFG cannot be certified to comply with any particular fuel sulfur content as natural gas or liquefied petroleum gas are, and Forward landfill is not required to monitor the LFG sulfur content. Therefore, the following conditions will be included on the ATC to ensure and demonstrate compliance with the SO_x limit:

N-8569-1-0, '-2-0, '-3-0:

- *The sulfur compound content of the landfill gas entering this stationary source shall be monitored and recorded monthly. After four consecutive monthly tests show compliance, the monitoring frequency may be reduced to once every calendar quarter. If quarterly monitoring shows an exceedance of the limit, then monthly monitoring shall resume and continue until four consecutive months of monitoring show compliance with the limit. Once compliance with the limit is shown for four consecutive months, then the monitoring frequency may return to quarterly. Monitoring shall not be required in any month during which neither the engines nor the flare operate. Records of monitoring results shall be maintained as required elsewhere in this permit. [District Rule 2201]*

- *Monitoring of the landfill gas sulfur compound content shall be performed using Draeger tubes or an alternative method approved in writing by the District. [District Rule 2201]*

3. Record Keeping

The engines associated with this proposal are subject to District Rule 4702, which specifies record keeping requirements for these units. Furthermore, the flare is subject to District Rule 4311, which specifies record keeping requirements for this unit. Therefore, the record keeping requirements shall be discussed in the portions of this document devoted to the applicable rules.

In addition, Ameresco has proposed SLCs of 19,999 lb-VOC/yr and 199,999 lb-CO/yr, to be enforced by appropriate record keeping. The following condition will be included on the ATCs to ensure adequate record keeping and enforce the SLCs:

N-8569-1-0, '-2-0 (LFG-Fired IC Engines):

- *Permittee shall maintain records of actual gross electrical output from this engine, in kW-hr. [District Rule 2201]*

- *Permittee shall maintain records of actual VOC and CO emissions from this LFG-fired engine. Emissions shall be calculated as follows: (actual gross electrical output, in kW-hr) x (1.341 bhp/kW) x (emission factor calculated from most recent source test data for that pollutant, g/bhp-hr) ÷ (453.6 g/lb) ÷ (0.96). [District Rule 2201]*

- *Permittee shall maintain records of actual VOC and CO emissions from this stationary source. Records for comparison with the annual VOC and CO emission limit shall be updated at least once each calendar month. [District Rule 2201]*

N-8569-3-0 (Waste Gas-Fired Flare:

- *Permittee shall maintain records of actual VOC and CO emissions from this waste gas-fired flare. Emissions shall be calculated as follows: (heat input to the flare, MMBtu) x (emission factor calculated from most recent source test data for that pollutant, lb/MMBtu). [District Rule 2201]*

- *Permittee shall maintain records of actual VOC and CO emissions from this stationary source. Records for comparison with the annual VOC emission limit shall be updated at least once each calendar month. [District Rule 2201]*

- *All records shall be maintained and retained on-site for a period of at least 5 years and shall be made available for District inspection upon request. [District Rule 1070]*

4. Reporting

The engines associated with this proposal are subject to District Rule 4702, which specifies reporting requirements for these units. In addition, the flare is subject to District Rule 4311, which specifies reporting requirements for this unit. Therefore, the reporting requirements shall be discussed in the portions of this document devoted to the applicable rules. No further discussion is required.

5. Installation, Operation, and Maintenance

Pursuant to Sections 5.6.2 and 5.6.3 of the rule, an ATC will include conditions to ensure that the new or modified source is built according to the specifications and plans included in the application, or which are necessary to assure construction and operation in the manner assumed in the application review. The following conditions will be included on the ATCs to ensure proper installation, operation, and maintenance:

N-8569-1-0, '-2-0, '-3-0:

- *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]*

- *Permittee shall install, calibrate, and maintain in operation a volumetric, totalizing, non-resettable gas flow meter to measure the volume of landfill gas entering this stationary source. [District Rule 2201]*

F. Ambient Air Quality Analysis

Section 4.14.1 of this Rule 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.

Note, this facility is not a Major Source for PM2.5 emissions. Furthermore, this proposal will shift the duty of burning the landfill gas from the existing landfill gas flares operated by Forward Landfill to the proposed equipment. Based on the analysis in Appendix E, shifting the duty of burning the landfill gas from the existing landfill gas flares to the proposed equipment will not result in an increase in PM2.5 emissions. Therefore, PM2.5 modeling was not required.

The Technical Services Division of the SJVAPCD conducted the required analysis. As shown in the summary of the results of this analysis that is attached in Appendix D of this document, the project will not cause or make worse a violation of an air quality standard.

Rule 2520 Federally Mandated Operating Permits

As shown in Section VII.D.3 of this document, Ameresco is not a major source for any pollutant. In addition, Ameresco includes two stationary IC engines that are subject to NSPS Subpart JJJJ and this would normally make this facility subject to the Title V permitting requirement of the rule as specified in Section 2.4. However, Section 2.4 specifically provides for the exemption in Section 4.2 for NSPS and NESHAP where USEPA, in promulgating the NSPS or NESHAP, gave the affected facility a deferral of, or exemption from the Part 70 (Title V) permit requirement. 40 CFR 60.4230(c) specifically states that an area source subject to Subpart JJJJ is not required to obtain a Part 70 permit provided the facility is not required to obtain a permit under 40 CFR 70.3 for a reason other than its status as an area source subject to Subpart JJJJ. Since Ameresco is not a major source for any pollutant, and is not subject to any other NSPS or NESHAP, it is exempt from Rule 2520 under Section 4.2. No further discussion is required.

Rule 4001 New Source Performance Standards (NSPS)

This rule incorporates by reference the NSPS specified in Title 40 Code of Federal Regulations, Part 60 (40 CFR 60). Subpart JJJJ applies to stationary spark ignition internal combustion engines such as those in this proposal. This subpart includes emission limitations for NO_x, CO, and VOC from engines it applies to, along with monitoring, reporting, and record keeping requirements. The emission limits in this subpart are compared with the limits for the proposed engines in the following table:

	Subpart JJJJ Limit	Proposed Emissions	Compliant?
NOx	3.0 g/bhp-hr	Start-up = 0.50 g/bhp-hr Steady State = 0.15 g/bhp-hr	Yes
CO	5.0 g/bhp-hr	1.8 g/bhp-hr	Yes
VOC	1.0 g/bhp-hr	0.14 g/bhp-hr	Yes

VOC emissions from the proposed engines can be calculated as follows from the potential emissions calculated Section VII.C.2:

EF = (22.5 lb /day) x (1 day/24 hr) x (453.6 g/lb) ÷ (3,012 bhp) = 0.14 g/bhp-hr

As shown above, Ameresco has proposed engines that will comply with the NSPS Subpart JJJJ requirements. No further discussion of this subpart is required.

NSPS Subpart WWW specifies the requirements for landfills above certain size thresholds and which have the potential to emit non-methane organic compounds (NMOC) above a certain threshold. Forward Landfill (N-4070) is subject to the requirements of Subpart WWW, but Ameresco is a separate stationary source not directly subject to this subpart. However, EPA guidance indicates that LFGTE projects such as this are still required to comply with the NMOC emission limit in this subpart. Both the engines and the flare combust LFG and are subject to the NMOC control requirements in this subpart. The following conditions will be included on the ATCs to ensure compliance:

N-8569-1-0, '-2-0 (LFG-Fired IC Engines):

- *Either the non-methane organic compound (NMOC) emissions from this landfill gas-fired engine shall not exceed 20 ppmvd (as hexane) at 3% O2 or the NMOC destruction efficiency shall be at least 98%. [District Rule 2201 and 40 CFR 60.752(b)(2)(iii)(B)]*

N-8569-3-0 (Waste Gas-Fired Flare:

- *Either the non-methane organic compound (NMOC) emissions from this waste gas-fired flare shall not exceed 20 ppmvd (as hexane) at 3% O2 or the NMOC destruction efficiency shall be at least 98%. [District Rule 2201 and 40 CFR 60.752(b)(2)(iii)(B)]*

Rule 4002 National Emission Standards for Hazardous Air Pollutants (HESHAP)

This rule incorporates by reference the NESHAP from 40 CFR 61 and 40 CFR 63. Subpart ZZZZ establishes emission limits and operational limits for stationary reciprocating internal combustion engines located at major sources and area sources of HAP. Since an area source of HAP is any stationary source that is not a major source of HAP, this subpart applies to any stationary reciprocating IC engine. Pursuant to §63.6590(a)(2)(iii), Ameresco's proposal is subject to this Subpart as a new facility at an area source of HAP because they will commence construction on or after June 12, 2006. However, pursuant to §63.6590(c) a new stationary reciprocating IC engine meets the requirements of this subpart by complying with the requirements of 40 CFR 60, Subpart JJJJ for spark ignition engines. Therefore, compliance with Rule 4001 will ensure compliance with Rule 4002, and no further discussion is necessary.

Rule 4101 Visible Emissions

This rule defines and regulates visible emissions of air contaminants. The following condition will be included on each ATC to ensure compliance:

N-8569-1-0,'-2-0, '-3-0:

- *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

This rule prohibits discharge of air contaminants which could cause injury, detriment, nuisance or annoyance to the public. The following condition will be included on each ATC to ensure compliance with this requirement:

N-8569-1-0, '-2-0, '-3-0:

- *No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]*

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 must perform an analysis to determine the possible impact to the nearest resident or worksite.

An HRA is not required for a project with a total facility prioritization score of less than or equal to one. According to the Technical Services Memo for this project (Appendix D), the total facility prioritization score including this project was less than or equal to one. Therefore, no further analysis is required to determine the impact from this project and compliance with the District's Risk Management Policy is expected.

RMR Summary				
Categories	**Type of Unit (Unit 1-0, 2-0)**	**Type of Unit (Unit 3-0)**	**Project Totals**	**Facility Totals**
Prioritization Score	0.01	0.01	0.02	0.02
Acute Hazard Index	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Chronic Hazard Index	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Maximum Individual Cancer Risk (10^{-6})	N/A[3]	N/A[3]	N/A[3]	N/A[3]
T-BACT Required?	**No**	**No**		
Special Permit Conditions?	**Yes**	**Yes**		

[3]Acute and Chronic Hazard Index and Maximum Individual Cancer Risk were not calculated since the total facility prioritization score was less than 1.0.

The technical services memo requires the following special permit conditions to ensure the validity of the health risk assessment result.

N-8569-1-0, '-2-0 (LFG-Fired IC Engines):

- *The engine exhaust shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap, roof overhang, or any other obstruction. [District Rule 4102]*
- *The exhaust stack shall have a minimum height of 40 feet above the ground, and a maximum inside diameter of 20 inches at the point where the exhaust gas is emitted to the atmosphere. [District Rules 2201 and 4102]*

N-8569-3-0 (Waste Gas-Fired Flare):

- *The engine exhaust shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap, roof overhang, or any other obstruction. [District Rule 4102]*
- *The flare shall have a minimum stack height of 50 feet above the ground. [District Rules 2201 and 4102]*

Rule 4201 Particulate Matter Concentration

This rule prohibits the emission of particulate matter at a concentration is excess of 0.1 grain per cubic foot of exhaust gas at dry standard conditions. The emission limit for each of these engines is 0.05 g/bhp-hr, which can be converted to an exhaust concentration as follows:

C = (0.05 g/bhp-hr) x (15.432 gr/g) x (1 bhp-hr/5,987 Btu) x (1 MMBtu/9,399 ft^3) x (10^6 Btu/MMBtu)
C = 0.014 gr/ft^3

Since 0.014 gr/ft^3 is less than the rule limit of 0.1 gr/ft^3, compliance with this rule is expected.

The emission limit for the flare is 0.20 lb/MMBtu, which can be converted to an exhaust concentration as follows:

C = (0.20 lb/MMBtu) x (5.64 MMBtu/hr) x (7,000 gr/lb) ÷ [(2,084 ft^3/min) x (60 min/hr)]
C = 0.063gr/ft^3

Since 0.063 gr/ft^3 is less than the rule limit of 0.1 gr/ft^3, compliance with this rule is expected. The following condition will be included on each ATC to ensure compliance:

N-8569-1-0, '-2-0, '-3-0:

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

Rule 4311 Flares

This rule regulates NO_x, SO_x, and VOC emissions from various flares. However, in accordance with Section 4.3 of the rule, any flare subject located at a stationary source with potential emissions less than 20,000 lb/yr for NO_x and VOC is exempt from the requirements of this rule except for the record keeping requirement of Section 6.1.4. The latter condition requires the permittee to maintain records demonstrating that NOx and VOC emissions are below the threshold. The potential to emit NOx at this facility is less than 20,000 lb/yr, while Ameresco has proposed an SLC (incorporated into the DEL conditions presented above) to ensure VOC emissions do not equal or exceed 20,000 lb/yr. Therefore, the flare is exempt from this rule and no further discussion is required.

Rule 4701 Internal Combustion Engines – Phase 1

This rule regulates NO_x, CO, and VOC emissions from various classes of IC engines. However, the engines are also subject to the requirements of District Rule 4702, which are more stringent. Therefore, compliance with the requirements of District Rule 4702 is expected to ensure compliance with District Rule 4701 requirements and no further discussion is necessary.

Rule 4702 Internal Combustion Engines – Phase 2

This rule regulates NO_x, CO, and VOC emissions from various classes of IC engines. These engines are full-time (as opposed to emergency or low-use) stationary engines not used in military tactical equipment, and therefore are not eligible for any of the exemptions in Section 4.0. Therefore, these engines are subject to the requirements of this rule.

Section 5.2.1, Table 2, specifies the emission limits for engines rated greater than 50 brake horsepower (bhp) and that are subject to this rule:

Engine Type	NO_x	CO	VOC
2. Lean-Burn			
a. Two stroke, gaseous fueled, less than 100 horsepower	75 ppmv or 85 % reduction	2000 ppmv	750 ppmv
b. All other engines	65 ppmv or 90 % reduction	2000 ppmv	750 ppmv
N-8569-1-0, -2-0	14 ppmv	271 ppmv	41 ppmv

[T] As pentane, equivalent to 370 ppmv as methane

NO_x emissions are converted from the g/bhp-hr emission limit to an equivalent concentration:

C = (0.15 g/bhp-hr) x (1 bhp-hr/5,987 Btu) x (1 MMBtu/9,399 ft^3) x (10^6 Btu/MMBtu) x (1 lb/453.6 g) x (1 lb-mol/46 lb) x (379.5 ft^3/lb-mol) ÷ ((20.95) ÷ (20.95 – 15.00))
C = 14 ppmv

CO emissions are converted from the g/bhp-hr emission limit to an equivalent concentration:

C = (1.8 g/bhp-hr) x (1 bhp-hr/5,987 Btu) x (1 MMBtu/9,399 ft^3) x (10^6 Btu/MMBtu) x (1 lb/453.6 g) x (1 lb-mol/28 lb) x (379.5 ft^3/lb-mol) ÷ ((20.95) ÷ (20.95 – 15.00))
C = 271 ppmv

As determined in project S-1080811, the emission limit of 0.20 g/bhp-hr for VOC is equivalent to 41 ppmv as methane at 15% O_2.

As shown by the calculations above, emissions of NO_x, CO, and VOC from these engines will comply with the emission limits listed in Section 5.2.1 (Table 1) of District Rule 4702.

Section 5.2.2, Table 2, lists future NOx, VOC, and CO emission requirements for these engines that will become effective in 2014, 2015, 2016, or 2017, depending on which compliance schedule the engines are subject to. Since these requirements are not currently in effect, compliance with these future emission requirements will not be demonstrated at this time.

Section 5.3, 5.4, and 5.5 apply to engines with continuous emissions monitors (CEM), or to engines that comply with the NO_x emission reduction percentages in Section 5.2. These engines do not fall into either of these categories, so these sections of the rule do not apply.

Section 5.6 lists a payment of annual fee in lieu of complying with a NOx emission limit option. This option allows operator to comply by paying fees in lieu of complying with the emission limits listed in Section 5.2.2. Since the emission limits in Section 5.2.2 are not currently in effect, compliance with this future requirement will not be demonstrated at this time.

Section 5.7 lists SOx emission control requirements. These requirements will become effective in 2014, 2015, 2016, or 2017, depending on which compliance schedule the engines are subject to. Since these requirements are not currently in effect, compliance with these future SOx emissions control requirements will not be demonstrated at this time.

Section 5.8 lists monitoring requirements for non-AO spark-ignited engines and are currently applicable to the proposed engines.

Section 5.8.1 requires that the owner of an engine subject to the requirements of Section 5.2 must comply with the requirements specified in Sections 5.6.1 through 5.8.11.

Section 5.8.1 requires an engine with a rated brake horsepower of 1,000 hp or greater (and which is allowed to operate more than 2,000 hours per year), or with an external emissions control device, to either install, operate, and maintain continuous emissions monitoring equipment for NO_x, CO, and oxygen, as identified in Rule 1080 (Stack Monitoring), or install, operate, and maintain APCO-approved alternative monitoring. The applicant has proposed monitoring of NO_x, CO and O_2 on a quarterly basis in accordance with monitoring scheme A of the District Policy SSP-1810, *Emissions Monitoring for Rule 4701 and 4702*. Therefore, the applicant's alternative monitoring proposal meets the requirements of this section of the rule.

Section 5.8.6 requires the owner to install and operate a nonresettable elapsed operating time meter. The applicant is proposing a non-resettable time meter for each landfill gas-fired IC engine and meets the requirements of this section of the rule.

Section 5.6.7 requires that each engine, implement the Inspection and Monitoring (I&M) plan, if any, submitted to and approved by the APCO pursuant to Section 6.5. The applicant has proposed monitoring of NO_x, CO and O_2 on a quarterly basis. This proposal has previously been approved for other projects. Therefore, the applicant's I&M plan meets the requirements of this section of the rule.

Section 5.8.9 requires that for each engine use a portable NO_x analyzer to take NO_x emissions readings to verify compliance with the emissions requirements of Section 5.1 or Section 8.0 during each calendar quarter in which a source test is not performed and the engine is operated. The applicant is proposing to measure NO_x emissions directly. District Policy SSP-1810, *Emissions Monitoring for Rules 4701 and 4702*, stipulates that period monitoring of NO_x emission concentrations should occur quarterly. However, the District's experience with other biogas-fired engines using add-on control devices indicates that significant variability in fuel quality and emissions is possible, and that monthly emissions monitoring is more appropriate for engines with add-on control devices, at least until consistent compliance with the emission limit is demonstrated. Furthermore, although SSP–1810 normally requires that deviations above the emission limits, as measured during periodic monitoring, be corrected within 8 hours after detection, Ameresco has requested a 24-hour window for correcting deviations. The District agrees that, in this specific case, the complexity of the add-on emissions control equipment and siloxane removal system make an 8-hour window for correcting deviations excessively stringent. The following conditions will be included on each engine ATC to ensure compliance with the monitoring requirements:

N-8569-1-0, '-2-0 (Landfill Gas-Fired IC Engines):

- *The permittee shall monitor and record the stack concentration of NOx, CO, and O2 at least once every calendar month (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO.] 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. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 4701 and 4702]*

- *If either the NOx or CO concentrations corrected to 15% O2, as measured by the portable analyzer, exceed the allowable emission concentration, the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 24 hours after detection. If the portable analyzer readings continue to exceed the allowable emissions concentration after 24 hours, 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 performing the notification and testing required by this condition. [District Rules 4701 and 4702]

- *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 Rules 4701 and 4702]*

- *The permittee shall maintain records of: (1) the date and time of NOx, CO, and O2 measurements, (2) the O2 concentration in percent and the measured NOx and CO concentrations corrected to 15% O2, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 4701 and 4702]*

Section 5.9 of the rule presents the alternative monitoring requirements for various engines not subject to the normal monitoring requirements of Section 5.6. These engines are required to monitor emissions under Section 5.6, so Section 5.7 does not apply. Section 5.8 addresses the requirement of certain engines that are exempt from permits but required to register under the Permit-Exempt Equipment Registration Program. These engines are subject to the requirement to obtain permits, so Section 5.8 does not apply.

Section 5.10 lists SOx emission monitoring requirements. These requirements will become effective in 2014, 2015, 2016, or 2017, depending on which compliance schedule the engines are subject to. Since these requirements are not currently in effect, compliance with these future SOx emissions monitoring requirements will not be demonstrated at this time.

Section 6.1 requires the operator of an engine to submit an emission control plan for all actions taken to satisfy the emission requirements of Section 5.2. Pursuant to Section 7.5.1, an operator with two engines is required to submit an emission control plan by 7/1/12. The following condition will be included on each engine ATC:

N-8569-1-0, '-2-0 (Landfill Gas-Fired IC Engines):

- *Permittee shall submit an emission control plan for this engine, as specified in Section 6.1 of District Rule 4702, by July 1, 2012. [District Rule 4702]*

Section 6.2 requires the owner of an engine subject to the requirements of Section 5.2 to maintain an engine operating log to demonstrate compliance with this rule. 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:

- Total hours of operation,
- Type of fuel used,
- Maintenance or modifications performed,
- Monitoring data,
- Compliance source test results, and
- Any other information necessary to demonstrate compliance with this rule.

Section 6.2.2 requires that the data collected pursuant to the requirements of Sections 5.8 and 5.9 be maintained for at least five years, be readily available, and be made available to the APCO upon request. The following conditions will be included on each engine ATC to ensure compliance with these requirements:

N-8569-1-0, '-2-0 (Landfill Gas-Fired IC Engines):

- *The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: total hours of operation, type of fuel used, maintenance or modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. [District Rules 4701 and 4702]*

- *All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. [District Rules 4701 and 4702]*

Section 6.3.2.1 requires that the new landfill gas-fired IC engines be source tested at initial start-up and once every 24 months thereafter. Section 6.4 lists pre-approved test methods to be used when source testing. The following conditions will be included on each engine ATC to ensure compliance with these requirements:

N-8569-1-0, '-2-0 (Landfill Gas-Fired IC Engines):

- *Source testing to measure landfill gas-combustion NOx, CO, NH3, and VOC emissions, and NMOC emissions and destruction efficiency, from this unit shall be conducted within 90 days of initial start-up. [District Rules 4701 and 4702 and 40 CFR 60.752(b)(2)(iii)(B)]*

- *Source testing to measure landfill gas-combustion NOx, CO, and VOC emissions from this unit shall be conducted not less than once every 24 months. [District Rules 4701 and 4702]*

- *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 Rules 4701 and 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 both as methane and as hexane. NOx and CO concentrations shall be reported in ppmv, corrected to 15% oxygen. VOC concentrations shall be reported in ppmv, corrected to 15% oxygen as methane and corrected to 3% oxygen as hexane. [District Rules 4701 and 4702 and 40 CFR 60.752(b)(2)(iii)(B)]*

- *The following test methods shall be used: NOx (ppmv) - EPA Method 7E or ARB Method 100, CO (ppmv) - EPA Method 10 or ARB Method 100, stack gas oxygen - EPA Method 3 or 3A or ARB Method 100, VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100, and NMOC (ppmv) - EPA Method 18, 25, 25A, or 25C. [District Rules 1081, 4701, and 4702, and 40 CFR 60.754(d)]*

Section 6.5 lists Inspection and Maintenance (I&M) plan requirements for the engines. The following condition will be included on each engine ATC to ensure compliance with these requirements:

- *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 Rules 4701 and 4702]*

Rule 4801 Sulfur Compounds

This rule prohibits the emission of sulfur compounds in excess of 2,000 ppmv (as SO_2). The proposed daily emission limitation can be converted to emission concentrations as follows for comparison to the rule limit:

$C = (150/10^6) \times (1\ SO_2/H_2S) \times (1\ ft^3/525\ Btu) \times (10^6\ Btu/9{,}399\ ft^3) = 30$ ppmv

Note that the above calculation uses parameters that are only dependant on the characteristics of the LFG, rather than on the emission unit combusting the LFG. Therefore, no emission unit-specific calculation need be conducted. Since 30 ppmv is less than the rule limit of 2,000 ppmv, compliance with the SO_x DEL will ensure compliance with the rule limit. No further discussion is required.

California Health & Safety Code 42301.6 (School Notification)

The District has determined that this equipment will not be located within 1,000 feet of the outer boundary of the nearest K-12 school. Therefore, the school notification requirements of CH&SC 42301.6 do not apply. No further discussion is required.

California Environmental Quality ACT (CEQA)

The California Environmental Quality Act (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 San Joaquin Valley Unified Air Pollution Control District (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.
- 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.

The County of San Joaquin (County) is the public agency having principal responsibility for approving the Project. As such, the County served as the Lead Agency for the project. Consistent with CEQA Guidelines §15081, a Negative Declaration was prepared and certified by the County.

The District is a Responsible Agency for the project because of its discretionary approval power over the project via its Permits Rule (Rule 2010) and New Source Review Rule (Rule 2201), (CEQA Guidelines §15381). As a Responsible Agency the District complies with CEQA by considering the Negative Declaration prepared by the Lead Agency, and by reaching its own conclusion on whether and how to approve the project (CEQA Guidelines §15096). The District has considered the Negative Declaration certified by the County.
The District's engineering evaluation of the project (this document) demonstrates that compliance with District rules and permit conditions would reduce Stationary Source emissions from the project to levels below the District's thresholds of significance for criteria pollutants. Thus, the District concludes that through a combination of project design elements and permit conditions, project specific stationary source emissions will be reduced to less than significant levels. The District has determined that no additional findings are required (CEQA Guidelines §15096(h)).

IX. Recommendation

Compliance with all applicable rules and regulations is expected. Pending completion of a successful public notification period, issue Authorities to Construct N-8569-1-0, '-2-0, and '-3-0 subject to the conditions on the draft Authorities to Construct in Appendix A.

X. Billing Information

Billing Information		
Permit Number	**Fee Schedule**	**Description**
N-8569-1-0	3020-10-F	3,012 bhp IC engine
N-8569-2-0	3020-10-F	3,012 bhp IC engine
N-8569-3-0	3020-02-G	5.64 MMBtu/hr

Appendices

Appendix A: Draft Authority to Construct
Appendix B: LFG-Fired IC Engine BACT Top-Down Analysis
Appendix C: Siloxane Removal System BACT Top-Down Analysis
Appendix D: Health Risk Assessment and Ambient Air Quality Analysis Results
Appendix E: Comparison of PM2.5 Emissions between Existing Landfill Flares and Ameresco's Proposed Landfill Gas to Energy System
Appendix F: QNEC Calculations

Appendix A
Draft Authority to Construct

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: N-8569-1-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: AMERESCO FORWARD, LLC
MAILING ADDRESS: 111 SPEEN STREET, SUITE 410
FRAMINGHAM, MA 01701

LOCATION: 9999 SOUTH AUSTIN ROAD
MANTECA, CA

EQUIPMENT DESCRIPTION:
3,012 BHP GE ENERGY MODEL JGS616 LANDFILL GAS-FIRED LEAN BURN IC ENGINE POWERING A 2,175 KW ELECTRICAL GENERATOR AND SERVED BY A SILOXANE REMOVAL SYSTEM (SHARED WITH PERMIT UNIT N-8569-2), AN OXIDATION CATALYST, AND A SELECTIVE CATALYTIC REDUCTION SYSTEM

CONDITIONS

1. {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]
2. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
3. {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]
4. {1407} 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]
5. Permittee shall install, calibrate, and maintain in operation a volumetric, totalizing, non-resettable gas flow meter to measure the volume of landfill gas entering this stationary source. [District Rule 2201]
6. {3796} This engine shall be equipped with an operational nonresettable elapsed time meter or other APCO approved alternative. [District Rule 4702]
7. {3202} This engine shall be operated and maintained in proper operating condition per the manufacturer's requirements as specified on the Inspection and Monitoring (I&M) plan submitted to the District. [District Rule 4702]
8. The engine 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]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (209) 557-6400 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

DRAFT

DAVID WARNER, Director of Permit Services
N-8569-1-0 : Oct 13 2011 1:24PM -- HARADERJ : Joint Inspection NOT Required

9. The engine exhaust stack shall have a minimum height of 40 feet above the ground, and a maximum inside diameter of 20 inches at the point where the exhaust gas is emitted to the atmosphere. [District Rules 2201 and 4102]
10. The concentration of sulfur compounds in the landfill gas entering this stationary source shall not exceed 150 ppmvd as H2S. [District Rule 2201]
11. The landfill gas flow rate to this stationary source shall not exceed 2,084 scf/min. [District Rule 2201]
12. This engine shall be fired exclusively with landfill gas. [District Rule 2201]
13. Emissions from this landfill gas-fired engine shall not exceed 0.15 g-NOx/bhp-hr, 0.05 g-PM10/bhp-hr, 1.8 g-CO/bhp-hr, 0.20 g-VOC/bhp-hr, and 15 ppmvd NH3 at 15% O2. [District Rules 2201 and 4102]
14. Either the non-methane organic compound (NMOC) emissions from this landfill gas-fired engine shall not exceed 20 ppmvd (as hexane) at 3% O2 or the NMOC destruction efficiency shall be at least 98%. [District Rule 2201 and 40 CFR 60.752(b)(2)(iii)(B)]
15. CO emissions from this stationary source shall not exceed 199,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]
16. VOC emissions from this stationary source shall not exceed 19,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]
17. The permittee shall monitor and record the stack concentration of NOx, CO, and O2 concurrently at least once every calendar month (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO.] 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 five days of restarting the engine unless monitoring has been performed within the last month. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 4701 and 4702]
18. The permittee shall monitor and record the stack concentration of NH3 at least once every calendar quarter (in which a source test is not performed). NH3 monitoring shall be conducted utilizing Draeger tubes or a District approved equivalent method. 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 five days of restarting the engine unless monitoring has been performed within the last month. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rule 2201]
19. If either the NOx or CO concentrations corrected to 15% O2, as measured by the portable analyzer, exceed the allowable emission concentration, the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 24 hours after detection. If the portable analyzer readings continue to exceed the allowable emissions concentration after 8 hours, 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 performing the notification and testing required by this condition. [District Rules 4701 and 4702]
20. 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 Rules 4701 and 4702]
21. The permittee shall maintain records of: (1) the date and time of NOx, CO, and O2 measurements, (2) the O2 concentration in percent and the measured NOx and CO concentrations corrected to 15% O2, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 4701 and 4702]

CONDITIONS CONTINUE ON NEXT PAGE

22. The sulfur compound content of the landfill gas entering this stationary source shall be monitored and recorded monthly. After four consecutive monthly tests show compliance, the monitoring frequency may be reduced to once every calendar quarter. If quarterly monitoring shows an exceedance of the limit, then monthly monitoring shall resume and continue until four consecutive months of monitoring show compliance with the limit. Once compliance with the limit is shown for four consecutive months, then the monitoring frequency may return to quarterly. Monitoring shall not be required in any month during which neither the engines nor the flare operate. Records of monitoring results shall be maintained as required elsewhere in this permit. [District Rule 2201]
23. Monitoring of the landfill gas sulfur compound content shall be performed using Draeger tubes or an alternative method approved in writing by the District. [District Rule 2201]
24. Source testing to measure landfill gas-combustion NOx, CO, NH3, and VOC emissions, and NMOC emissions and destruction efficiency, from this unit shall be conducted within 90 days of initial start-up. [District Rules 4701 and 4702 and 40 CFR 60.752(b)(2)(iii)(B)]
25. Source testing to measure landfill gas-combustion NOx, CO, NH3, and VOC emissions from this unit shall be conducted at least once every 12 months. After demonstrating compliance on two consecutive annual source tests, the unit shall be tested not less than once every 24 months. If the result of the 24-month source test demonstrates that the unit does not meet the applicable emission limits, the source testing frequency shall revert to at least once every 12 months. [District Rules 2201, 4701, and 4702]
26. 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 Rules 4701 and 4702]
27. {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]
28. {110} The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081]
29. 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 both as methane and as hexane. NOx and CO concentrations shall be reported in ppmv, corrected to 15% oxygen. VOC concentrations shall be reported in ppmv, corrected to 15% oxygen as methane and corrected to 3% oxygen as hexane. [District Rules 4701 and 4702 and 40 CFR 60.752(b)(2)(iii)(B)]
30. The following test methods shall be used: NOx (ppmv) - EPA Method 7E or ARB Method 100, CO (ppmv) - EPA Method 10 or ARB Method 100, stack gas oxygen - EPA Method 3 or 3A or ARB Method 100, VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100, and NMOC (ppmv) - EPA Method 18, 25, 25A, or 25C. [District Rules 1081, 4701, and 4702, and 40 CFR 60.754(d)]
31. The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: total hours of operation, type of fuel used, maintenance or modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. [District Rules 4701 and 4702]
32. {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]
33. Permittee shall maintain records of actual gross electrical output from this engine, in kW-hr. [District Rule 2201]
34. Permittee shall maintain records of actual VOC and CO emissions from this LFG-fired engine. Emissions shall be calculated as follows: (actual gross electrical output, in kW-hr) x (1.341 bhp/kW) x (emission factor calculated from most recent source test data for that pollutant, g/bhp-hr) ÷ (453.6 g/lb) ÷ (0.96). [District Rule 2201]
35. Permittee shall maintain records of actual VOC and CO emissions from this stationary source. Records for comparison with the annual VOC and CO emission limit shall be updated at least once each calendar month. [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

36. All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. [District Rules 4701 and 4702]

37. Permittee shall submit an emission control plan for this engine, as specified in Section 6.1 of District Rule 4702, by July 1, 2012. [District Rule 4702]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: N-8569-2-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: AMERESCO FORWARD, LLC
MAILING ADDRESS: 111 SPEEN STREET, SUITE 410
FRAMINGHAM, MA 01701

LOCATION: 9999 SOUTH AUSTIN ROAD
MANTECA, CA

EQUIPMENT DESCRIPTION:
3,012 BHP GE ENERGY MODEL JGS616 LANDFILL GAS-FIRED LEAN BURN IC ENGINE POWERING A 2,175 KW ELECTRICAL GENERATOR AND SERVED BY A SILOXANE REMOVAL SYSTEM (SHARED WITH PERMIT UNIT N-8569-1), AN OXIDATION CATALYST, AND A SELECTIVE CATALYTIC REDUCTION SYSTEM

CONDITIONS

1. {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]
2. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
3. {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]
4. {1407} 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]
5. Permittee shall install, calibrate, and maintain in operation a volumetric, totalizing, non-resettable gas flow meter to measure the volume of landfill gas entering this stationary source. [District Rule 2201]
6. {3796} This engine shall be equipped with an operational nonresettable elapsed time meter or other APCO approved alternative. [District Rule 4702]
7. {3202} This engine shall be operated and maintained in proper operating condition per the manufacturer's requirements as specified on the Inspection and Monitoring (I&M) plan submitted to the District. [District Rule 4702]
8. The engine 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]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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DAVID WARNER, Director of Permit Services
N-8569-2-0 : Oct 13 2011 1:24PM – HARADERJ : Joint Inspection NOT Required

9. The engine exhaust stack shall have a minimum height of 40 feet above the ground, and a maximum inside diameter of 20 inches at the point where the exhaust gas is emitted to the atmosphere. [District Rules 2201 and 4102]
10. The concentration of sulfur compounds in the landfill gas entering this stationary source shall not exceed 150 ppmvd as H2S. [District Rule 2201]
11. The landfill gas flow rate to this stationary source shall not exceed 2,084 scf/min. [District Rule 2201]
12. This engine shall be fired exclusively with landfill gas. [District Rule 2201]
13. Emissions from this landfill gas-fired engine shall not exceed 0.15 g-NOx/bhp-hr, 0.05 g-PM10/bhp-hr, 1.8 g-CO/bhp-hr, 0.20 g-VOC/bhp-hr, and 15 ppmvd NH3 at 15% O2. [District Rules 2201 and 4102]
14. Either the non-methane organic compound (NMOC) emissions from this landfill gas-fired engine shall not exceed 20 ppmvd (as hexane) at 3% O2 or the NMOC destruction efficiency shall be at least 98%. [District Rule 2201 and 40 CFR 60.752(b)(2)(iii)(B)]
15. CO emissions from this stationary source shall not exceed 199,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]
16. VOC emissions from this stationary source shall not exceed 19,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]
17. The permittee shall monitor and record the stack concentration of NOx, CO, and O2 concurrently at least once every calendar month (in which a source test is not performed) using a portable emission monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO.] 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 five days of restarting the engine unless monitoring has been performed within the last month. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rules 4701 and 4702]
18. The permittee shall monitor and record the stack concentration of NH3 at least once every calendar quarter (in which a source test is not performed). NH3 monitoring shall be conducted utilizing Draeger tubes or a District approved equivalent method. 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 five days of restarting the engine unless monitoring has been performed within the last month. Records must be maintained of the dates of non-operation to validate extended monitoring frequencies. [District Rule 2201]
19. If either the NOx or CO concentrations corrected to 15% O2, as measured by the portable analyzer, exceed the allowable emission concentration, the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 24 hours after detection. If the portable analyzer readings continue to exceed the allowable emissions concentration after 8 hours, 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 performing the notification and testing required by this condition. [District Rules 4701 and 4702]
20. 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 Rules 4701 and 4702]
21. The permittee shall maintain records of: (1) the date and time of NOx, CO, and O2 measurements, (2) the O2 concentration in percent and the measured NOx and CO concentrations corrected to 15% O2, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 4701 and 4702]

CONDITIONS CONTINUE ON NEXT PAGE

22. The sulfur compound content of the landfill gas entering this stationary source shall be monitored and recorded monthly. After four consecutive monthly tests show compliance, the monitoring frequency may be reduced to once every calendar quarter. If quarterly monitoring shows an exceedance of the limit, then monthly monitoring shall resume and continue until four consecutive months of monitoring show compliance with the limit. Once compliance with the limit is shown for four consecutive months, then the monitoring frequency may return to quarterly. Monitoring shall not be required in any month during which neither the engines nor the flare operate. Records of monitoring results shall be maintained as required elsewhere in this permit. [District Rule 2201]
23. Monitoring of the landfill gas sulfur compound content shall be performed using Draeger tubes or an alternative method approved in writing by the District. [District Rule 2201]
24. Source testing to measure landfill gas-combustion NOx, CO, NH3, and VOC emissions, and NMOC emissions and destruction efficiency, from this unit shall be conducted within 90 days of initial start-up. [District Rules 4701 and 4702 and 40 CFR 60.752(b)(2)(iii)(B)]
25. Source testing to measure landfill gas-combustion NOx, CO, NH3, and VOC emissions from this unit shall be conducted at least once every 12 months. After demonstrating compliance on two consecutive annual source tests, the unit shall be tested not less than once every 24 months. If the result of the 24-month source test demonstrates that the unit does not meet the applicable emission limits, the source testing frequency shall revert to at least once every 12 months. [District Rules 2201, 4701, and 4702]
26. 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 Rules 4701 and 4702]
27. {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]
28. {110} The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081]
29. 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 both as methane and as hexane. NOx and CO concentrations shall be reported in ppmv, corrected to 15% oxygen. VOC concentrations shall be reported in ppmv, corrected to 15% oxygen as methane and corrected to 3% oxygen as hexane. [District Rules 4701 and 4702 and 40 CFR 60.752(b)(2)(iii)(B)]
30. The following test methods shall be used: NOx (ppmv) - EPA Method 7E or ARB Method 100, CO (ppmv) - EPA Method 10 or ARB Method 100, stack gas oxygen - EPA Method 3 or 3A or ARB Method 100, VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100, and NMOC (ppmv) - EPA Method 18, 25, 25A, or 25C. [District Rules 1081, 4701, and 4702, and 40 CFR 60.754(d)]
31. The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: total hours of operation, type of fuel used, maintenance or modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance. [District Rules 4701 and 4702]
32. {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]
33. Permittee shall maintain records of actual gross electrical output from this engine, in kW-hr. [District Rule 2201]
34. Permittee shall maintain records of actual VOC and CO emissions from this LFG-fired engine. Emissions shall be calculated as follows: (actual gross electrical output, in kW-hr) x (1.341 bhp/kW) x (emission factor calculated from most recent source test data for that pollutant, g/bhp-hr) ÷ (453.6 g/lb) ÷ (0.96). [District Rule 2201]
35. Permittee shall maintain records of actual VOC and CO emissions from this stationary source. Records for comparison with the annual VOC and CO emission limit shall be updated at least once each calendar month. [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

36. All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. [District Rules 4701 and 4702]

37. Permittee shall submit an emission control plan for this engine, as specified in Section 6.1 of District Rule 4702, by July 1, 2012. [District Rule 4702]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: N-8569-3-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: AMERESCO FORWARD, LLC
MAILING ADDRESS: 111 SPEEN STREET, SUITE 410
FRAMINGHAM, MA 01701

LOCATION: 9999 SOUTH AUSTIN ROAD
MANTECA, CA

EQUIPMENT DESCRIPTION:
SILOXANE REMOVAL SYSTEM SERVED BY A 5.64 MMBTU/HR ABUTEC MODEL HTF WASTE GAS-FIRED FLARE

CONDITIONS

1. {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]
2. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
3. {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]
4. {1407} 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]
5. {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]
6. The flare exhaust stack shall have a minimum height of 50 feet above the ground, and a maximum inside diameter of 30 inches at the point where the exhaust gas is emitted to the atmosphere. [District Rules 2201 and 4102]
7. The concentration of sulfur compounds in the landfill gas entering this stationary source shall not exceed 150 ppmvd as H2S. [District Rule 2201]
8. The landfill gas flow rate to this stationary source shall not exceed 2,084 scf/min. [District Rule 2201]
9. This flare shall be fired with waste gas from the siloxane removal system, with landfill gas as supplemental fuel and propane for startup. [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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DAVID WARNER, Director of Permit Services
N-8569-3-0 : Oct 12 2011 8:50AM – HARADERJ : Joint Inspection NOT Required

10. Emissions from this waste gas-fired flare shall not exceed 0.041 lb-NOx/MMBtu, 0.20 lb-PM10/MMBtu, 0.20 lb-CO/MMBtu, and 0.14 lb-VOC/MMBtu. [District Rule 2201]
11. Either the non-methane organic compound (NMOC) emissions from this waste gas-fired flare shall not exceed 20 ppmvd (as hexane) at 3% O2 or the NMOC destruction efficiency shall be at least 98%. [District Rule 2201 and 40 CFR 60.752(b)(2)(iii)(B)]
12. CO emissions from this stationary source shall not exceed 199,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]
13. VOC emissions from this stationary source shall not exceed 19,999 pounds in any rolling 12-consecutive-month period. [District Rule 2201]
14. Source testing to measure the VOC and CO emission concentrations, and NMOC emissions and destruction efficiency, shall be conducted within 90 days of initial startup and annually thereafter. [District Rule 2201]
15. Source testing shall be conducted using EPA Method 25, 25C, or 18 (for VOC concentration), EPA Method 10 or 10B or ARB Method 100 (for CO concentration), EPA Method 3 or 3A (for oxygen concentration), and NMOC (ppmv) - EPA Method 18, 25, 25A, or 25C. [District Rule 2201]
16. {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]
17. {110} The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081]
18. Permittee shall maintain records of actual VOC and CO emissions from this waste gas-fired flare. Emissions shall be calculated as follows: (heat input to the flare, MMBtu) x (emission factor calculated from most recent source test data for that pollutant, lb/MMBtu). [District Rule 2201]
19. Permittee shall maintain records of actual VOC and CO emissions from this stationary source. Records for comparison with the annual VOC emission limit shall be updated at least once each calendar month. [District Rule 2201]
20. {3246} All records shall be maintained and retained on-site for a period of at least 5 years and shall be made available for District inspection upon request. [District Rule 1070]

Appendix B
LFG-Fired IC Engine Top-Down BACT Analysis

NO_x BACT:

Step 1 – Identify All Possible Control Technologies:

The following NO_x control technologies and emissions limits are identified by the Best Available Control Technology Analysis in District project N-1103269.

1) NO_X emissions ≤ 0.15 g/bhp-hr (Selective Catalytic Reduction (SCR), or Selective Non-Catalytic Reduction (SNCR) system.) – Achieved in Practice
2) Microturbine[3] (0.5 lb/MW-hr) – Alternate Basic Equipment
3) Fuel Cell (≤ 0.05 lb/MW-hr ≈ 1.5 ppmv NO_X @ 15% O_2) – Alternate Basic Equipment

Step 2 – Eliminate Technologically Infeasible Options:

There are no technologically infeasible options.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

1) Fuel Cell (1.5 ppmv NO_x @ 15% O_2) – Alternate Basic Equipment
2) NO_x emissions of 0.15 g/bhp-hr (SCR or SNCR) – Achieved in Practice
3) Microturbine[4] (0.5 lb/MW-hr) – Alternate Basic Equipment

As shown previously, to produce 2.175 MW of electrical output the engine with SCR at 0.15 g/bhp-hr produces 23.9 lb-NO_x/day. A microturbine producing the same amount of electricity produces 26.1 lb-NO_x/day. Since the use of a microturbine results in higher NOx emissions than Achieved-in-Practice Option #2, the use of a microturbine will not be considered.

Step 4 – Cost Effectiveness Analysis

Option 1: Fuel Cells (≤ 0.05 lb/MW-hr ≈ 1.5 ppmv NO_X @ 15% O_2)

Since Fuel Cells have reduced NO_X 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.

Assumptions

- Landfill Gas Production: 56,520 scf per hour = 495.1 MMscf/yr (applicant)
- Biogas F-Factor: 9,399 dscf/MMBtu (60 °F)
- Higher Heating Value for Landfill Gas: 525 Btu/scf
- Molar Specific Volume = 379.5 scf/lb-mol (60°F)
- Price for electricity: $0.093/kW-hr (based on California Renewable Energy Tariff)
- Btu to kW-hr conversion: 3,413 Btu/kW-hr

[3] The NO_x emission limit specified for a microturbine is the current requirement for waste gas-fired microturbines certified under the Air Resources Board distributed generation program.
[4] (2.175 MW) x (24 hr) x (0.5 lb/MW-hr) = 26.1 lb/day

Assumptions for Proposed Landfill Gas-Fired IC Engines

- Typical purchase and Installation Cost for lean burn engines: $1,475/kW (estimated based on extensive review conducted by District)
- Typical operation costs for engines: $0.0152/kW-hr [5]
- Rule 4702 NO_X emission limit for waste gas fueled lean burn IC engines: 0.252 lb/MMBtu (65 ppmv @ 15% O_2)
- 40 CFR Part 60, Subpart JJJJ limit: 1.0 g-VOC/bhp-hr

Assumptions for Fuel Cell System

- Net electrical efficiency for fuel cell power plant: 39% (includes parasitic load for gas conditioning system)
- Typical Purchase and Installation Cost for fuel cells including cost for biogas conditioning system: $7,000/kW
- Typical operation costs for fuel cells: $0.0215/kW-hr [5]
- Fuel cell Stack Replacement Cost: $500/kW-yr (conservatively estimated based stack replacement being one quarter of initial installation cost and stack replacement being required every 3.5 years)
- Fuel Cell NO_X emissions: 0.07 lb/MW-hr (0.02 lb/MMBtu, *ARB Distributed Generation Certification)*
- Fuel Cell VOC emissions: 0.02 lb-VOC/MW-hr (0.003 lb/MMBtu, *ARB Distributed Generation Certification*)
- Size of fuel cell system needed for proposed project: 2,175 kW
- Fuel cells may offer the ability for greater heat recovery in comparison to an IC engine; however, the value of this heat will not be quantified since it is not known if the facility has an economical use for it.

1. 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 fuel cells and IC engines for a 2,175 kW system.

The incremental capital cost for replacement of the proposed IC engines with fuel cells is calculated as follows:

2,175 kW x ($7,000/kW – $1,475/kW) = **$12,016,875**

The biogas conditioning system that is already assumed in the above annual cost was developed for a dairy digester project. The biogas conditioning system is required to remove hydrogen sulfide from the biogas, but it is not designed to remove siloxanes from biogas because dairy digesters typically produce negligible siloxanes. LFG, on the other hand, can contain substantial concentrations of siloxanes which must be removed in order for the fuel cell to function.

[5] Based on extensive research conducted for District project S-1080811.

The applicant has provided capital costs for a siloxane removal system and additional construction costs, for a total of $1,829,651. The total capital cost of the siloxane removal system and incremental cost of the fuel cells is:

C = ($12,016,875) + ($1,829,651) = $13,846,526

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.

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

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

$A = [\$13,846,526 \times 0.1(1.1)^{10}] \div [(1.1)^{10}-1] =$ **$2,253,458/year**

2. Annual Costs:

Electricity Generated

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

Proposed IC Engines

(2,175 kW) x (8,760 hr/yr) = 19,053,000 kW-hr/year

Fuel Cells (Alternate Equipment)

= (56,520 scf/hr) x (525 Btu/scf) x (1 kW-hr/3,413 Btu) x (0.39) x (8,760 hr/yr)
= 29,702,560 kW-hr/year

Annual Costs of Increased Electric Generation

(19,053,000 kW-hr/yr – 29,702,560 kW-hr/yr) x $0.093/kW-hr = **$ -990,409/year**

Annual Operation and Maintenance Cost

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

Proposed IC Engines

(19,053,000 kW-hr/year) x ($0.0152/kW-hr) = **$289,606/year**

Fuel Cells (Alternate Equipment)

(29,702,560 kW-hr/yr) x ($0.0215/kW-hr) = **$638,605/year**

Annual Costs of Increased Maintenance

($328,794/yr) – ($213,043/yr) = **$348,999/year**

Fuel Cell Stack replacement Costs

($500/kW-yr) x (2,175 kW) = **$1,087,500/year**

Siloxane Removal System Maintenance

The applicant has provided an estimate of additional operational and maintenance costs for the siloxane removal system, which total $300,845/yr.

3 Total Increased Annual Costs for Fuel Cell System as an Alternative to Proposed Engines:

= ($2,253,458/yr) – ($990,409/yr) + ($348,999/yr) + ($1,087,500/yr) + ($300,845/yr)
= **$3,000,393/year**

4. NO_X and VOC Emission Reductions:

Pursuant to the District's Revised BACT Cost Effectiveness ~~Thresholds~~ Memo (5/14/08), District Standard Emissions that will be used to compare with the alternative equipment will be based on the emission limits for lean burn agricultural IC engines contained in District Rule 4702, Section 5.1.1, Table 2b. Note that District standard emissions cannot be greater (in the case of CO and VOC) than the emissions allowable under the applicable Federal NSPS, Subpart JJJJ. The following emissions factors will be used for the cost analysis:

District Standard Emissions for IC engines:

0.252 lb-NO_X/MMBtu (65 ppmv NO_X @ 15% O_2)
0.87 lb-VOC/MMBtu (1.0 g-VOC/bhp-hr)[6]

[6] EF = (1.0 g/bhp-hr) ÷ [(3,413 Btu/kW-hr) x (1 kW/1.341 bhp)] x (1 lb/453.6 g) x (10^6 Btu/MMBtu) = 0.87 lb/MMBtu

Emissions from Fuel Cells as Alternative Equipment:

0.021 lb-NO_X/MMBtu (0.07 lb/MW-hr)
0.0027 lb-VOC/MMBtu (0.02 lb/MW-hr)

5. Proposed Engines Compared to Fuel Cells based on District Standard Emission Reductions:

NO_X Emission Reductions
(495.1 MMscf/yr) x (525 Btu/scf) x (0.252 lb-NO_X/MMBtu – 0.021 lb-NO_X/MMBtu)
= 60,043 lb-NO_X/yr (30.02 ton/yr)

VOC Emission Reductions
(495.1 MMscf/yr) x (525 Btu/scf) x (0.87 lb-VOC/MMBtu – 0.0027 lb-VOC/MMBtu)
= 225,435 lb-VOC/yr (112.72 ton/yr)

6. Multi-Pollutant Cost Effectiveness Thresholds (MCET) for NO_X and VOC Reductions based on District Standard Emission Reductions:

[(30.02 ton-NO_X/year) x ($24,500/ton-$NO_X$)] + [(112.72 ton-VOC/year) x ($17,500/ton-VOC)]
= $2,708,090/year

As shown above, the annualized cost of this alternative ($3,000,393/yr) exceeds the Multi-Pollutant Cost Effectiveness Threshold (MCET) calculated for the NO_X and VOC emission reductions. Therefore, pursuant to the District's BACT policy, this option is not cost effective and is being removed from consideration.

Option 2: NO_x emissions of 0.15 g/bhp-hr (9-14 ppmvd @ 15% O_2)

Ameresco has proposed to install SCR for each engine to ensure compliance with a NO_x emission limit of 0.15 g/bhp-hr. Since the applicant has proposed this level of control, and this level of control is achieved in practice, a cost effectiveness analysis is not required. No further discussion is required.

Step 5 – Select BACT

BATC is satisfied by Ameresco's proposal to use IC engines controlled by SCR to comply with an emission limit of 0.15 g/bhp-hr. No further discussion is required.

SO_x BACT:

Step 1 – Identify All Possible Control Technologies:

The following SO_x control technologies and emissions limits were identified by the Best Available Control Technology Analysis in project N-1103269.

1) Dry absorption of H_2S from the fuel gas (98-99% -Technologically Feasible)
2) Wet absorption of H_2S from the fuel gas (95-98% -Technologically Feasible)
3) Sulfur content of fuel gas not exceeding 150 ppmv H_2S (Achieved in Practice/Contained in SIP)

Step 2 – Eliminate Technologically Infeasible Options

None of the above control options are technologically infeasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Most of the SO_x emission control technologies offer some control efficiency in comparison with the uncontrolled emissions, and these technologies can be ranked based on the comparative control efficiencies. However, in order for valid emission reduction calculations to be conducted the baseline uncontrolled emissions must be known. The host landfill has not been required to monitor the H_2S content of the LFG; however, the existing LFG collection and control system includes a SO_x emission limit of 0.0215 lb/MMBtu which allows the calculation of the uncontrolled sulfur content as H_2S.

$C = (0.0215\ lb_{SOx}/MMBtu) \times (1\ lb\text{-}mol_{SOx}/64\ lb_{SOx}) \times (1\ lb\text{-}mol_{H2S}/lb\text{-}mol_{SOx}) \times (506\ Btu/ft^3) \times (1\ MMBtu/10^6\ Btu) \times (379.5\ ft^3/lb\text{-}mol_{H2S}) \times 10^6$
$C = 65$ ppmv

65 ppmv fuel sulfur as H_2S is less than the achieved in practice limit of 150 ppmv as H_2S. However, using a lower fuel sulfur baseline during the cost effectiveness analysis for technologically feasible control options would tend to make those technologically feasible controls less cost effective. Therefore, Ameresco's proposed limit of 150 ppmv, intended to comply with the SIP-approved sulfur content for LFG included in SCAQMD Rule 431.1, will be considered the uncontrolled fuel sulfur content. The control efficiencies associated with the technologically feasible alternatives will be evaluated as a reduction from the uncontrolled sulfur content of 150 ppmv as H_2S.

1) Dry absorption of H_2S from the fuel gas (98-99%)
2) Wet absorption of H_2S from the fuel gas (95-98%)
3) Sulfur content of fuel gas not exceeding 150 ppmv H_2S (0%)

Step 4 – Cost Effectiveness Analysis

Ameresco has provided cost data for two types of dry absorption system (SulfaTreat and iron sponge scrubbing). The cost for each of these systems will be evaluated separately, and the lower annual cost will be used in calculating the cost of emission reductions. Ameresco has also provided cost data for the SO_x LO-CAT wet absorption system.

Dry Absorption using SulfaTreat:
SulfaTreat is a registered trademark for a broad line of H_2S absorption products, most of which are designed for use on gaseous streams. The cost estimate from Mi Swaco (the vendor) and SCS Engineers (consultant/construction contractor) includes $604,930 for capital and installation costs, with another $259,168 per year for operational costs. In accordance with the procedure prescribed in APR-1305, the capital and installation costs are annualized as follows:

$A = (\$604,930) \times [((0.1) \times (1 + 0.1)^{10}) \div ((1 + 0.1)^{10} - 1))] = \$98,450/yr$

The total annual cost is calculated by adding the annualized capital & installation cost to the annual operating cost, for a total of $357,618/yr.

Dry Absorption using Iron Sponge:
The capital and installation cost estimate from SCS Engineers and MVLLC Company (iron sponge vendor) is $664,950, which can be annualized as follows:

$A = (\$664,950) \times [((0.1) \times (1 + 0.1)^{10}) \div ((1 + 0.1)^{10} - 1))] = \$108,218/yr$

SCS Engineers estimates that the operational cost for the system would be $230,410/yr. The total annual cost would be $338,628/yr. Since the annual cost of iron sponge scrubbing is expected to be lower than the $357,618/yr cost of a SulfaTreat system, the costs associated with iron sponge scrubbing will be used in calculating the cost of emission reductions from dry absorption of H_2S as a SO_x control measure.

Dry absorption is expected to provide 98-99% control efficiency for H_2S in the landfill gas. For the sake of a more conservative cost analysis, 99% control efficiency will be used. The controlled SO_x emissions can be calculated as follows:

$PE_{SOx} = (150/10^6) \times (1 - 0.99) \times (1\ lb\text{-}mol/379.5\ ft^3) \times (1\ SO_2/H_2S) \times (64\ lb/lb\text{-}mol) \times (2{,}084\ ft^3/min) \times (60\ min/hr) \times (24\ hr/day)$
$PE2_{SOx} = 0.8\ lb/day$
$PE2_{SOx} = (0.8\ lb/day) \times (365\ day/yr) = 292\ lb/yr$

The uncontrolled emissions were previously shown as being 75.9 lb/day for SO_x, equivalent to:

$PE2 = (75.9\ lb/day) \times (365\ day/yr) = 27{,}704\ lb/yr$

Note that both of these calculations are extremely conservative since they assume all of the LFG entering the Ameresco site is sent to a single engine. Since the H_2S control system must be large enough to treat all of the LFG coming on-site, the costs are appropriately scaled to the controlled and uncontrolled emission calculated above. Although each engine (and the waste gas flare) will be permitted to emit SO_x up to the amounts calculated above, it is not correct to multiply the emissions by the number of engines because only so much LFG (and H_2S) can come on-site and the emissions calculated above account for all of the potential H_2S and resulting SO_x emissions.

The cost of emission reductions is calculated by dividing the total annual cost by the reduction in emissions, calculated in tons.

Cost = ($338,628/yr) ÷ [((27,704 lb/yr) – (292 lb/yr)) ÷ (2,000 lb/ton)] = $24,707/ton

The cost of $24,707 per ton of SO_x emissions prevented exceeds the cost effectiveness ceiling of $18,300/ton specified in the May 2008 Revised BACT Cost Effectiveness Memorandum. Therefore, dry absorption of H_2S to control SO_x emissions from the combustion of LFG is not cost effective. This control option will be removed from consideration at this time.

Wet Absorption using SO_x LO-CAT:
SCS Engineers has provided a cost estimate for a LO-CAT system as $2,471,453 for capital and installation cost, and another $211,769 as operational costs.

$A = (\$2,471,453) \times [((0.1) \times (1 + 0.1)^{10}) \div ((1 + 0.1)^{10} - 1))] = \$402,218/yr$

The total annual cost is estimated at $613,987/yr. The controlled emissions resulting from the assumed 98% control efficiency is:

$PE_{SOx} = (150/10^6) \times (1 - 0.98) \times (1 \text{ lb-mol}/379.5 \text{ ft}^3) \times (1 \text{ } SO_2/H_2S) \times (64 \text{ lb/lb-mol}) \times (2,084 \text{ ft}^3/\text{min}) \times (60 \text{ min/hr}) \times (24 \text{ hr/day})$
$PE2_{SOx} = 1.5 \text{ lb/day}$
$PE2_{SOx} = (1.5 \text{ lb/day}) \times (365 \text{ day/yr}) = 548 \text{ lb/yr}$

The cost of emission reductions is calculated as follows:

Cost = ($613,987/yr) ÷ [((27,704 lb/yr) – (548 lb/yr)) ÷ (2,000 lb/ton)] = $45,219/ton

The cost of $45,219/ton exceeds the cost effectiveness ceiling of $18,300/ton. Wet absorption using SO_x LO-CAT is not cost effective and will be removed from consideration at this time.

Fuel gas sulfur content of 150 ppmv or less as H_2S:
The applicant has proposed this level of control, which is also achieved in practice. No cost effectiveness analysis is required.

Step 5 – Select BACT

The BACT requirement is satisfied by the applicant's proposal to limit the LFG sulfur content to 150 ppmv as H_2S. No further discussion is required.

PM_{10} BACT:

The following PM_{10} control technologies and emissions limits were identified by the Best Available Control Technology Analysis in project N-1103269.

Step 1 – Identify All Possible Control Technologies:

1. 0.08 g/bhp-hr (0.2 lb/hr from 1,408 bhp engine[7], or equivalent) – Achieved in Practice (ARB Clearinghouse for Chino Bay Desalter Authority, SCAQMD)
2. 0.07 g/bhp-hr – Technologically Feasible

Step 2 – Eliminate Technologically Infeasible Options

None of the above control technologies are technologically infeasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

1. 0.07 g/bhp-hr
2. 0.08 g/bhp-hr

Step 4 – Cost Effectiveness Analysis

Ameresco has proposed a PM10 limit of 0.05 g/bhp-hr, which is more stringent than the most effective control remaining from Step 3. No cost effectiveness analysis is required.

Step 5 – Select BACT

BACT is satisfied by Ameresco's proposed emission limit of 0.05 g-PM_{10}/bhp-hr. No further discussion is required.

[7] The limit stated in the ARB BACT Clearinghouse is 0.2 lb/hr. Since this limit is stated with one significant digit, emissions measured at 0.249 lb/hr would not violate this limit. To avoid a rounding error that may artificially depress the emission limit, the g/bhp-hr equivalent will be calculated using 0.249 lb/hr as follows:
(0.249 lb/hr) x (453.6 g/lb) ÷ (1,408 bhp) = 0.08 g/bhp-hr

VOC BACT:

Step 1 – Identify All Possible Control Technologies:

The following VOC control technologies and emissions limits were identified by the Best Available Control Technology Analysis in project N-1103269.

1) VOC emissions ≤ 0.20 g/bhp-hr (equivalent to 41 ppmvd @ 15% O_2 as CH_4) (lean burn or equivalent and positive crankcase ventilation) - (Achieved in Practice)
2) Fuel Cell (≤ 0.02 lb/MW-hr ≈ 2.0 ppmv VOC @ 15% O_2 as CH_4) - (Alternate Basic Equipment)
3) Microturbine (equivalent to achieved-in-practice BACT for VOC from IC engines) - (Alternate Basic Equipment)

Step 2 - Eliminate technologically infeasible options

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

Step 3 - Rank remaining options by control effectiveness

1) Fuel Cell (≤ 0.02 lb/MW-hr ≈ 2.0 ppmv VOC @ 15% O_2 as CH_4)
2a) IC engine with VOC emissions ≤ 0.20 g/bhp-hr
2b) Microturbine (equivalent to 0.20 g/bhp-hr)

Step 4 - Cost Effectiveness Analysis

Option 1: Fuel Cell (≤ 0.02 lb/MW-hr ≈ 2.0 ppmv VOC @ 15% O_2 as CH_4):

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 at this time.

Option 2a: IC engines with VOC emissions ≤ 0.20 g/bhp-hr:

This option is achieved-in-practice. Therefore, a cost analysis is not required.

Option 2b: Microturbines:

VOC emissions from a microturbine are expected to be identical to those from an IC engine. Since the applicant has proposed an equivalent level of VOC control effectiveness, a cost analysis is not necessary.

Step 5 - Select BACT

The highest ranked control technology remaining is VOC emissions of 0.20 g/bhp-hr. The applicant has proposed lean burn IC engines with VOC emissions less than or equal to 0.20 g/bhp-hr. Therefore, the proposed IC engines meet BACT requirements for VOC.

Appendix C
Siloxane Removal System Top Down BACT Analysis

Ameresco Forward
N-8569, N-1110808

VOC BACT:

Step 1 – Identify All Possible Control Technologies

The following VOC control technologies and emissions limits were identified by the Best Available Control Technology Analysis in project N-1103269 for a siloxane system waste gas flare..

1. Flare with a control efficiency equal to or greater than 98%, or VOC emissions of 20 ppmv (as hexane) @ 3% O_2 – Achieved in Practice
2. Thermal oxidizer – Technologically Feasible
3. Catalytic oxidizer – Technologically Feasible

The District has utilized the AP-42 emission factor of 0.14 lb-VOC/MMBtu in calculating potential emissions from this flare, rather than 20 ppmv as hexane at 3% O_2. It must be noted that emissions in excess of 20 ppmv as hexane at 3% O_2 can still comply with the BACT requirement provided the 98% destruction efficiency requirement is satisfied. Therefore, compliance with the VOC emission concentration limit or destruction efficiency requirement is sufficient to satisfy the achieved-in-practice BACT requirement without requiring separate analysis of the 0.14 lb/MMBtu emission factor.

Step 2 – Eliminate Technologically Infeasible Options

The siloxane removal system is an emission source for siloxanes and various other organic contaminants removed from the LFG. When combusted, siloxanes form silica particulate that tends to coat surfaces exposed to the exhaust gas. Siloxanes are removed from the raw LFG so that the catalytic pollution control devices serving the engines can operated with a reasonable life expectancy. However, if those siloxanes were burned in a catalytic oxidizer, then the resulting silica would coat the oxidizer catalyst, merely transferring the problem from the engine catalyst to the oxidizer catalyst. Therefore, a catalytic oxidizer is not technologically feasible and will be removed from consideration.

In addition, it is noted that the distinction between a flare and a thermal oxidizer is generally a matter of where combustion occurs. A thermal oxidizer is generally equipped with a discrete combustion chamber equipped with baffles and similar devices to keep the waste gas stream within the combustion zone long enough (typically 0.5 – 1.0 seconds) to ensure the design destruction efficiency. It is expected that this internal structure is vulnerable to damage from the silica similar, although to a lesser extent, to the way that the internal components of an IC engine are vulnerable leading to greater maintenance costs. In contrast, a flare has a much more open internal structure; the simplest flares have burners at the outlet of an exhaust stack, with the result that there is little or nothing in the way of internal structure for the silica from siloxane combustion to coat. Therefore, a thermal oxidizer is considered not technologically feasible and will be removed from consideration.

Step 3 – Rank Remaining Control Technologies by Control Effectivness

1. Flare with a control efficiency equal to or greater than 98%, or VOC emissions of 20 ppmv (as hexane) @ 3% O_2

Step 4 – Cost Effectiveness Analysis

Ameresco has proposed to most effective control remaining ~~from Step 3. No cost effectiveness~~ analysis is required.

Step 5 – Select BACT

BACT is satisfied by Ameresco's proposal to use a flare with 98% control efficiency, or VOC emissions of 20 ppm (as hexane) @ 3% ~~O_2~~.

Appendix D
Health Risk Assessment and Ambient Air Quality Analysis Results

San Joaquin Valley Air Pollution Control District
Risk Management Review

To:	James Harader
From:	Matthew Cegielski-Technical Services
Date:	October 11, 2011
Facility Name:	Ameresco Forward
Location:	9999 South Austin Road Manteca, CA
Application #(s):	N-8569-1-0,2-0, and 3-0
Project #:	N-1110808

A. RMR SUMMARY

	RMR Summary			
Categories	**Landfill Gas ICE (Unit 1-0, 2-0)**	**Landfill Gas Flare (Unit 3-0)**	**Project Totals**	**Facility Totals**
Prioritization Score	0.01	0.01	0.02	0.02
Acute Hazard Index	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Chronic Hazard Index	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Maximum Individual Cancer Risk (10^{-6})	N/A[1]	N/A[1]	N/A[1]	N/A[1]
T-BACT Required?	**No**	**No**		
Special Permit Conditions?	**Yes**	**Yes**		

1 No further analysis was required since the prioritization score was below 1.0.

Proposed Permit Conditions

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

Units # 1-0, 2-0

1. {1898} The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap, roof overhang, or any other obstruction. [District Rule 4102]
2. Stack inside diameter must not be greater than 20 inches
3. Stack exhaust height may not be lower than 40 feet.
4. Standard conditions in the ATC

Unit # 3-0

1. {1898} The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap, roof overhang, or any other obstruction. [District Rule 4102]

2. Stack exhaust height may not be lower than 50 feet.

3. Standard conditions in the ATC

B. RMR REPORT

I. Project Description

Technical Services received a request on October 11, 2011 to perform an Ambient Air Quality Analysis and a Risk Management Review for two 3,012 BHP engines driving electric generators and one 5.64 MMBTU/ hr waste gas flare.

II. Analysis

Toxic emissions for the Landfill gas-fired IC engines were calculated using Landfill Gas Fired Internal Combustion Engine emission factors based on the 2002 Reciprocating Internal Combustion Engine (RICE) EPA database. Toxic emissions from this proposed Landfill Gas-Fired Flare unit were calculated using District approved emission factors based on the 1999 CARB Report, (Table 19, Flare, Landfill Gas) Development of Toxics Emission Factors from Source Test Data Collected Under the Air Toxics Hot Spots Program. In accordance with the District's *Risk Management Policy for Permitting New and Modified Sources* (APR 1905, March 2, 2001), risks from the proposed unit's toxic emissions were prioritized using the procedure in the 1990 CAPCOA Facility Prioritization Guidelines and incorporated in the District's HEARTs database. The prioritization score for this proposed unit was less than 1.0 (see RMR Summary Table). Therefore, no further analysis was necessary.

The following parameters were used for the review:

Analysis Parameters Unit 1-0, 2-0			
Source Type	Point	**Location Type**	Rural
Stack Height (m)	12.2	**Closest Receptor (m)**	853
Stack Diameter. (m)	0.508	**Type of Receptor**	Business
Stack Exit Velocity (m/s)	12.96	**Max Hours per Year**	8760
Stack Exit Temp. (°K)	762	**Fuel Type**	Landfill Gas

Analysis Parameters Unit 3-0			
Source Type	Flare	**Location Type**	Rural
Height (m)	15.2	**Closest Receptor (m)**	853
Eff. Height	16.7	**Type of Receptor**	Business
Exit Velocity (m/s)	20	**Max Hours per Year**	8760
Exit Temp. (°K)	1273	**Fuel Type**	Landfill Gas
Burner Rating (MMBtu/hr)	5.64		

Technical Services performed modeling for criteria pollutants CO, NOx, and SOx as well as a RMR. $PM_{2.5}$ and PM_{10} were not modeled since it was determined that there would be a reduction in PM with the operation of the flare in this project replacing the two flares in the landfill. The emission rates used for criteria pollutant modeling are attached. The engineer supplied the maximum fuel rate for the IC engines and flare used during the analysis.

The results from the Criteria Pollutant Modeling are as follows:

Criteria Pollutant Modeling Results*

Pollutant Name	1 Hour	3 Hours	8 Hours.	24 Hours	Annual
CO	Pass	X	Pass	X	X
NO_x	Pass[1]	X	X	X	Pass
SO_x	Pass	Pass	X	Pass	Pass

*Results were taken from the attached PSD spreadsheet.
[1]The project was compared to the 1-hour NO_2 National Ambient Air Quality Standard that became effective on April 12, 2010 using the District's approved procedures.

III. Conclusion

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

The prioritization score is less than 1.0. **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.

Attachments:
A. RMR request from the project engineer
B. Toxic emissions summary
C. Prioritization score
D. Facility Summary

Ameresco Forward
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Appendix E
Comparison of PM2.5 Emissions between Existing Landfill Flares and Ameresco's Proposed Landfill Gas to Energy System

Comparison of PM2.5 Emissions Between Existing Landfill System and Ameresco Proposed Landfill Gas to Energy System

The purpose of this analysis is to determine whether the approval of Ameresco's proposed landfill gas to energy equipment will result in an increase in actual PM2.5 emissions from this facility. For this evaluation, all PM10 from the combustion of landfill gas is considered to be PM2.5. Therefore, PM10 and PM2.5 are interchangeable.

PM2.5 Emission Calculations for Ameresco Proposed Landfill Gas to Energy System per SCF of Gas Burned

Ameresco's proposed landfill gas to energy system is rated to burn up to 2,084 SCFM of landfill gas. PM2.5 emissions will be emitted by the two proposed engines and the landfill gas flare. The following equation will be used to estimate the amount of PM2.5 emitted per MMSCF of gas burned.

$$\text{AmerescoEF} = \frac{2 \times \text{Engine Bhp} \times \text{EF}_{\text{Engines}} \frac{\text{g} - \text{PM2.5}}{\text{Bhp} - \text{hr}} \times \frac{\text{lb} - \text{PM2.5}}{453.6\text{g} - \text{PM2.5}} + \text{Flare Heat Input} \frac{\text{MMBtu}}{\text{hr}} \times \text{EF}_{\text{Flare}} \frac{\text{lb} - \text{PM2.5}}{\text{MMBtu}}}{\text{Gas Burn Rate (SCFM)} \times 60 \frac{\text{min}}{\text{hr}}}$$

Where,

Engine Bhp	= 3,012 Bhp (Engine Manufacturer)
$EF_{Engines}$	= 0.05 g-PM2.5/Bhp-hr (proposed by applicant)
Flare Heat Input	= 5.64 MMBtu/hr (Manufacturer's Rating)
EF_{Flare}	= 0.057 g/bhp-hr (Average over the carbon regeneration cycle)[8]
Gas Burn Rate	= 2,084 SCFM (Manufacturer's Rating)

Substituting the above values into the equation yield the following result:

$$\text{AmerescoEF} = \frac{2 \times 3012 \times 0.05 \frac{\text{g} - \text{PM2.5}}{\text{Bhp} - \text{hr}} \times \frac{\text{lb} - \text{PM2.5}}{453.6\text{g} - \text{PM2.5}} + 5.64 \frac{\text{MMBtu}}{\text{hr}} \times 0.057 \frac{\text{lb} - \text{PM2.5}}{\text{MMBtu}}}{2{,}084\ \text{(SCFM)} \times 60 \frac{\text{min}}{\text{hr}}} \times \frac{10^6 SCF}{MMSCF}$$

Ameresco EF = 7.9 lb-PM2.5/MMSCF of gas burned

[8] The siloxane flare is operated to regenerate the carbon beds associated with the siloxane removal system. Emissions from the siloxane flare are variable, as the concentration of landfill gas in the regenerating bed decreases exponentially during regeneration of a carbon bed. Based on data provided by Ameresco, the District estimates an average emission factor of 0.057 lb-PM2.5/MMBtu for the siloxane flare over the entire regeneration cycle.

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PM2.5 Emission Calculations for Existing Landfill Gas Flares per SCF of Gas Burned

There are two existing flares at Forward Landfill. The smaller flare is rated to burn 2,000 SCFM of landfill gas and the larger flare is rated to burn 3,400 SCFM of landfill gas. The following equation will be used to estimate the amount of PM2.5 emitted per SCF of gas burned.

$$\text{ForwardEF} = \frac{\text{Small Flare(SCFM)} \times \text{GasHHV} \frac{\text{Btu}}{\text{SCF}} \times \frac{\text{MMBtu}}{10^6\,\text{Btu}} \times \text{EF}_{\text{SmallFlare}} \frac{\text{lb}}{\text{MMBtu}} + \text{Large Flare(SCFM)} \times \text{Gas HHV} \frac{\text{Btu}}{\text{SCF}} \times \frac{\text{MMBtu}}{10^6\,\text{Btu}} \times \text{EF}_{\text{LargeFlare}} \frac{\text{lb}}{\text{MMBtu}}}{\text{Small Flare(SCFM)} + \text{Large Flare(SCFM)}} \times \frac{10^6\,\text{SCF}}{\text{MMSCF}}$$

Where,

Small Flare SCFM	= 2,000 SCFM (Manufacturer's rating)
GAS HHV	= 525 Btu/SCF (Assumption shown earlier in this evaluation)
$EF_{SmallFlare}$	= 0.034 lb-PM2.5/MMBtu (previous project)
Large Flare SCFM	= 3,400 SCFM (Manufacturer's rating)
$EF_{LargeFlare}$	= 0.017 lb-PM2.5/MMBtu (previous project)

$$\text{ForwardEF} = \frac{2000\ \text{SCFM} \times 525 \frac{\text{Btu}}{\text{SCF}} \times \frac{\text{MMBtu}}{10^6\,\text{Btu}} \times 0.034 \frac{\text{lb}}{\text{MMBtu}} + 3400\ \text{SCFM} \times 525 \frac{\text{Btu}}{\text{SCF}} \times \frac{\text{MMBtu}}{10^6\,\text{Btu}} \times 0.017 \frac{\text{lb}}{\text{MMBtu}}}{2000\ \text{SCFM} + 3400\ \text{SCFM}} \times \frac{10^6\,SCF}{MMSCF}$$

Forward EF = 12.2 lb-PM2.5/MMSCF of gas burned

Conclusion

Since the emission factor for the proposed Ameresco system (7.9 lb-PM2.5/MMSCF) is less than the emission factor for the existing flares operated by Forward Landfill (12.2 lb-PM2.5/MMSCF), shifting the duty of burning landfill gas from the existing landfill gas flares will not result in an increase in actual PM2.5 emissions.

Appendix F
QNEC Calculations

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

QNEC = PE2 – BE, where:

QNEC = Quarterly Net Emissions Change for each emissions unit, lb/qtr
PE2 = Post Project Potential to Emit for each emissions unit, lb/qtr
BE = Baseline Emissions for each emissions unit, lb/qtr

Using the values in Sections VII.C.2 and VII.D.4 in the evaluation above, quarterly PE2 and quarterly PE1 can be calculated as follows:

$PE2_{quarterly}$ = $PE2_{annual}$ ÷ 4 quarters/year
$BE_{quarterly}$ = BE_{annual} ÷ 4 quarters/year

Quarterly Net Emissions Increase (QNEC) (lb/qtr)							
Unit	Pollutant	PE2	BE	Quarter 1	Quarter 2	Quarter 3	Quarter 4
N-8569-1-0, '-2-0 (each)	NO_X	8,724	0	2,181	2,181	2,181	2,181
	SO_X	27,704	0	6,926	6,926	6,926	6,926
	PM_{10}	4,088	0	1,022	1,022	1,022	1,022
	CO	104,719	0	26,179	26,180	26,180	26,180
	VOC	11,644	0	2,911	2,911	2,911	2,911
N-8569-3-0	NO_X	2,008	0	502	502	502	502
	SO_X	27,704	0	6,926	6,926	6,926	6,926
	PM_{10}	2,482	0	620	620	621	621
	CO	9,892	0	2,473	2,473	2,473	2,473
	VOC	6,935	0	1,733	1,734	1,734	1,734