STATEMENT OF BASIS

Facility Name:	Solar Turbines, Inc.
Application Number:	APCD2012-APP-001937
Equipment Type:	Title V significant modification - turbine testing facility
Facility ID:	APCD1976-SITE-01130
Equipment Address:	4200 Ruffin Road San Diego, CA 92123
Responsible Official:	Ken Nolen
Responsible Official Title:	Vice President Oil and Gas
Facility Contact:	Lori Haase
Contact Title:	Environmental Health and Safety Office
Contact Affiliation:	Solar Turbines
Contact Phone:	(619) 544-5237
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Contact E-Mail:	lhaase@solarturbines.com
Permit Engineer:	Arthur Carbonell
Date Completed:	November 2, 2012

1.0 BACKGROUND

1.1 Type of Application: TIV

1.2 Permit History:

This application is for a significant modification to the existing Title V Permit (APCD2006-PTO-960991) as renewed most recently under APCD2010-APP-001258.

1.3 Facility Description:

This facility tests various turbines under a variety of conditions. There are several other permitted emission units at this facility, mostly test cells. There is an open application for the construction of a thermal oxidizer (APCD2011-APP-001769), for which an ATC has been issued. This thermal oxidizer, along with one of the proposed new test cells (APP2012-APP-001938) was issued with the existing emission limits and therefore did not result in an increase in annual fuel usage at this facility. However, they are to be included in the proposed fuel increase.

See attached Form 1401-H2 for the list of Permits to Operate at this facility. Also, included are the following Authorities to Construct which have not yet become Permits to Operate.

Open Application Number	Equipment Description
APCD2011-ATC-001769	Thermal Oxidizer
APCD2012-APP-001938	Test Cell/Pad #20
APCD2012-APP-001939	Test Cell/Pad #24
APCD2012-APP-001941	Test Cell/Pad #26
APCD2012-APP-001939	Test Cell/Pad #25

1.4 Other Background Information:

None.

2.0 SIGNIFICANT MODIFICATION DESCRIPTION

This significant modification consists of the following:

- addition of four new test cells and one new thermal oxidizer;
- increase of annual NOx limit;
- increase of daily SOx and PM_{10} limits;
- modification of PM_{10} emission factors to reflect more recent test data.

The annual NOx limit is to be increase by 24.9 tons/yr so as to remain below major modification thresholds and, therefore, not require offsets. Daily SOx and PM10 limits are to be increased by 249 lbs/day and 99 tons/day, respectively, so as to remain below AQIA thresholds.

3.0 EMISSIONS

3.1 Emission Estimate Summary:

Table 1: Estimated Emissions Increases

	NOx	CO	VOC	SOx	PM_{10}
lbs/hr*	838.6	209.9	112.5	60.3	47.7
lbs/day	+1864.9	+349.4	+9.1	**+249**	**+99**
tons/yr	**+24.9**	+4.5	+2.3	+0.1	+1.3

Notes: 1. Hourly emissions represent total site emissions since there are no existing hourly limits.
2. Figures in bold represent increases proposed by the applicant. Other emissions extrapolated from these limits.
3. Hourly and daily missions based on "Scenario B" provided by the applicant as these represent worst-case values.
4. Annual emissions based on combination of "Scenario A" and "Scenario B" operating scenarios provided by applicant.

Table 2: Total Test Cell Emissions

Pollutant	PTE (tons/yr)
NOx	183.2
CO	33.0
VOC	0.9
SOx	17.0
PM_{10}	9.7

Notes: 1. "Test Cell" includes all test cells/pads, duct burner test pad, and thermal oxidizers.

3.2 Emission Estimate Assumptions:

Since the test cells are operated intermittently, the applicant provided two operating scenarios (specified as Scenario A and Scenario B) which represent maximum hourly fuel usage for the site. Based on these operating scenarios, the percentages of natural gas and distillate fuel used to generate the maximum hourly emissions were determined. These percentages were then used to determine the amount of natural gas and distillate fuel needed for a 24.9 ton increase in NOx emissions (i.e., it was assumed that ratio of natural gas to distillate fuel would remain constant for the year). These fuel usages were then used to determine the maximum increase in other criteria pollutants and toxic air contaminants. For annual emissions, it was assumed that the facility would be operated half the time under Scenario A and half under Scenario B. Emission calculations were based on default emission factors from AP-42 (via District website) or established site-specific emission indexes for this facility.

The same ratio of natural gas and distillate fuel usages were used to determine the total annual fuel usage for the facility based on a maximum NOx limit of 183.2 tons/yr (existing limit plus 24.9 tons/yr). This total fuel use was used to determine total criteria pollutant emissions as well as total emissions of greenhouse gases (using emission factors and global warming potentials from 40 CFR 60 Subpart 98).

3.3 Emission Calculations:

See attached calculation spreadsheets.

3.4 Attachments:

Operating scenarios provided by the applicant
Calculation spreadsheets

4.0 APPLICABLE RULES

4.1 See attached Form 1401-H1 for complete list of applicable rules.

The following District rules apply to the equipment being modified. No other equipment at this facility is affected by the proposed modifications and no other Title V operating conditions will be changed. No additional rules or regulations apply to this facility other than those listed in Form 1401-H1.

4.2 General Prohibitory Applicable Requirements

Rule 50 – Visible Emissions:
This rule limits air contaminant emissions into the atmosphere of shade greater than Ringlemann Number 1, to a maximum aggregate of three minutes in any consecutive sixty minute time period.
Based on the history of operation, with proper maintenance and operation, visible emissions are expected to comply with this requirement.

Rule 51 – No Nuisance:
This rule prohibits discharge of air contaminants that cause or have a tendency to cause injury, nuisance or annoyance to people and/or the public or damage to business or property.
Based on the history of operation, with proper maintenance and operation, no nuisance complaints are expected from the operation of this equipment.

Rule 53 – Specific Air Contaminants:
This rule prohibits the discharge of sulfur compounds, calculated as SO_2 in excess of 0.05% by volume on a dry basis and the discharge of particulate matter from combustion sources in excess of 0.10 grains/dscf standardized to 12% CO_2.
There are no changes to the sulfur content of natural gas or distillate fuels to be used in the test cells. Turbines tested in this test cell will be as clean or cleaner than previously tested engines. Continued compliance with this rule is expected.

Rule 62 – Sulfur Content of Fuels:
This rule prohibits the use of any gaseous fuel containing more than 10 grains of sulfur compounds, calculated as H_2S, per 100 dscf of gas, and any liquid fuel containing more than 0.5% sulfur by weight.
Rule 20 of the Public Utility Commissions (PUC) requires the sulfur content of natural gas sold in San Diego County to be less than 0.25 grains of H_2S per 100 dscf and less than 0.75 grains of total sulfur per 100 dscf. No distillate fuels will be used at this facility other than those already permitted. Continued compliance with this rule is expected.

4.2 New Source Review:
This facility is a major source for NOx. Therefore, rule 20.3 applies.

Rule 20.3 (d)(1)(iv) –Major Stationary Source BACT:
This part of the rule requires the installation of best available control technology on the equipment if the emission threshold value of 10 lbs/day is equaled or exceeded for NOx, CO, VOC, SOx, or PM_{10}.
Due to the intermittent operation, varying loads, and constant changing of turbine models, which is inherent in this type of operation, there is currently no technologically feasible BACT or LAER for turbine test cells. Additionally, there are no entries in any RACT/BACT/LAER Clearinghouse for turbine test cells.

Rule 20.3 (d)(2) –Major Stationary Source AQIA:

This part of the rule requires the applicant to conduct an Ambient Air Quality Impact Analysis of the unit's emissions if the emission threshold values are equaled or exceeded for NOx, CO, SOx, or PM_{10}. The threshold values for NOx and SOx are 25 lbs/hr, 250 lbs/day or 40 tons/yr. The threshold values for CO are 100 lbs/hr, 550 lbs/day or 100 tons/yr. The threshold values for PM_{10} are 100 lbs/day or 15 tons/yr.

AQIA thresholds are exceeded for NOx and CO emissions. An AQIA was performed by the applicant and reviewed by the District's Meteorology Group for NOx and CO emissions. It was determined that the proposed emission increase will not result in any violations of any ambient air quality standard. See Appendix E for AQIA report.

PM_{10} and SOx emissions are limited to an increase of 99 lbs/day and 249 lbs/day, respectively. Emissions of PM_{10}, SOx, and VOC do not exceed AQIA thresholds. See attached AQIA report.

Rule 20.3 (d)(3) – Prevention of Significant Deterioration (PSD):

This part of the rule requires any project which is expected to have a significant impact on any Class 1 area, as determined by an AQIA, to provide notification to the Federal Land Manager, federal EPA, California ARB, South Coast Air Quality Management District, and Imperial County Air Pollution Control District.

This site does not exceed PSD trigger levels. No additional analysis or notification is required.

Rule 20.3 (d)(5) – Offsets:

This part of the rule requires that emission reduction credits be provided if the emission threshold values are equaled or exceeded for NOx, VOC, SOx, or PM_{10}. The threshold value for NOx and VOC is 50 tons/yr. The threshold value for SOx and PM_{10} is 100 tons/yr.

There have been no other contemporaneous emission increases at this site in the last five years. Permit conditions will limit NOx emissions to below major modification thresholds. Estimated emissions for CO, VOC, SOx, and PM10 emissions are below major source thresholds. No emission offsets are required for this project.

Rule 20.3 (d)(6) – Use of District Bank ERCs:

This part of the rule allows the APCO to provide emission offsets from a District developed and maintained District ERC Bank.

Permit conditions will limit NOx emissions to below major modification thresholds. Estimated emissions for CO, VOC, SOx, and PM10 emissions are below major source thresholds. No emission offsets are required for this project.

Rule 20.3 (d)(7) – Exemption from LAER:

This part of the rule provides a stationary source which provides VOC or NOx emission reductions from within the stationary source at a ratio of 1.3 to 1.0 for any increase of VOC or NOx subject to LAER provisions shall be exempt from this rule for LAER and from further emission offsets.

No VOC or NOx emission reductions have been proposed by the applicant for this modification. This section is not applicable to this project.

Rule 20.3 (d)(8) – LAER and Federal Offset Requirements:

This part of the rule requires a project that has been determined to be a major modification and subject to LAER and federal emission offsets provisions shall submit sufficient information to determine emission increases as well as contemporaneous emission increases. The applicant shall also apply LAER and offsets for the project.

Permit conditions will limit emissions to below major modification thresholds. This section is not applicable to this project.

4.3 Toxics New Source Review:

Rule 1200 – Toxic Air Contaminants, New Source Review

This rule requires that a Health Risk Assessment be performed if emissions of any toxic air contaminant exceed the de minimum values specified in the rule. The cancer risk determined by the HRA must be less than one in a million or less than ten in a million if TBACT is installed. Additionally, both the chronic non-cancer and the acute health hazard indexes determined by the HRA must be less than one.

A Health Risk Assessment was performed by the District Toxics Group using same modeling setup for the AQIA. Toxics emissions were calculated using emission factors from the District website for natural gas and distillate fuel fired turbines. It was determined that the increase in emissions due to this modification resulted in a cancer risk less than one in a million and all health hazard indexes are less than 1.0. See attached HRA report.

4.4 Regulation XIV - Title V Operating Permits

Rule 1401 – Title V Applicability:

This rule applies to any stationary source that is a major stationary source as defined in this regulation; or subject to the acid rain provisions of Title IV of the federal Clean Air Act (CAA); or a solid waste incineration unit subject to Section 129(e) of the CAA.

This facility exceeds the major stationary source threshold for NOx (100 tons/yr) and is therefore subject to the requirements of Regulation XIV. Additionally, the proposed fuel increase would cause a violation of current applicable requirements. Therefore, this project qualifies as a significant permit modification.

Rule 1410(k) – Significant Permit Modification:

This section of the rule specifies that a significant permit modification is subject to new source review rules, including public notification. The modification shall not take place unless it is made part of the permit to operate or temporary authorization has been made.

This project has been determined to be in compliance with District NSR rules (see Section 4.2). Public notification shall be concurrent with Title V notification.

Rule 1410(p) – Permit Shield:

This section of the rule states that any source seeking a permit pursuant to this regulation may request that a permit shield be provided, to preclude enforcement of specific enumerated requirements where the Air Pollution Control Officer has determined in writing that such requirements are not applicable to the source and summarized the determination in the permit, or to limit enforcement to permit conditions for specified applicable requirements where the Air Pollution Control Officer has determined that compliance with such conditions may be deemed compliance with the underlying specified applicable requirements and the requirements are specifically identified as such in the permit.

The applicant has not requested any additional permit shields from any District rule or regulation as part of this modification. Existing Title V permit shields are not affected.

Rule 1415 – Permit Process Public Notification:

At least 30 days prior to issuance of a five year initial permit to operate subject to this regulation, a revised permit resulting from an application for significant modification or renewal of such a permit, the Air Pollution Control Officer shall publicly notice and make available a draft of the proposed permit for public and affected state review and comment as follows:

(1) Publication in a newspaper of general circulation of a notice of intent to issue a permit to operate.

(2) Notification to all persons requesting to be included in a mailing list for purposes of notification of all permit actions.

(3) By other means if determined necessary by the Air Pollution Control Officer to assure adequate notice to the affected public.
(4) Availability of a copy of the draft permit for public review at the Air Pollution Control District offices.

The District completed all public notification requirements. The public notification included a published notice, a listing on the District's website, and written notification to EPA, ARB, adjoining air districts (ICAPCD and SCAQMD), and the Pala Band of Mission Indians. The District received comments from EPA requesting inclusion of NSPS KKKK (Standards of Performance for Stationary Combustion Turbines) in the statement of basis. The District included the NSPS in this statement of basis.

4.4 Federal and State Regulations:

40 CFR 60, Subpart KKKK - Standards of Performance for Stationary Combustion Turbines
This NSPS applies to all stationary turbines equal to or greater than 10 MMBtu/hr. It sets specific emission limits for NOx and SOx and establishes monitoring and recordkeeping requirements. However, turbine test cells/stands are exempt from this subpart under Subsection 60.4310 (d).

40 CFR Part 98, Subpart A - General Provision
This rule requires monitoring, recordkeeping, and reporting requirements for any facility that contains a source category listed in Table A-3 of this subpart; or contains a source category listed in Table A-4 of this subpart and emits 25,000 metric tons CO_2e or more in combined emissions from stationary fuel combustion; or has an aggregate maximum rated heat input capacity of stationary fuel combustion units 30 MMBtu/hr or greater and emits 25,000 metric tons CO_2e or more in combined emissions from stationary fuel combustion.
Estimated CO_2e = 53,396 tons/yr and estimated aggregate heat input to the test cells exceed 30 MMBtu/hr. Therefore, this facility must submit an annual greenhouse gas report to EPA in accordance with the requirements of Subparts 98.3 and 98.4 of this regulation.

40 CFR Part 98, Subpart C - Mandatory Greenhouse Gas Reporting, Fuel Combustion
This subpart specifies the calculation methodology, emission factors, and global warming potentials required to determine the total emissions of greenhouse gases.
Using the information provided in this subpart, estimated greenhouse gas emissions from this facility are CO_2e = 53,396 tons/yr. These emissions are based on annual combustion of 3.14 x 10^7 lbs/yr of natural gas and 4.05 x 10^6 lbs/yr of distillate fuel.

Tailoring Rule
This rule requires a PSD analysis for any facility with potential to emit greenhouse gas equal to or greater than CO_2e = 100,000 tons/yr or have an increase in greenhouse gas emissions equal to or greater than CO_2e = 75,000 tons/yr.
Estimated CO_2e = 53,396 tons/yr. Therefore, no PSD analysis is required for greenhouse gases.

5.0 REVISED OPERATING CONDITIONS

1. Permittee shall comply with all applicable requirements of Rules 53 and 62.

2. A permit shield is granted from enforcement action for the following requirements: Rule(S) 52, 54, 68 and 69.3 based on the District's determination that these rules are not applicable to the above equipment.

3. This equipment shall only be fired with Public Utility Commission (PUC) quality natural gas, propane, butane, or the following distillate fuels: Diesel Nos. 1 and 2, Fuel Oil Nos. 1 and 2,

kerosene, Jet A, JP-4 and JP-5 fuels, or a mixture of these fuels. The use of any other fuel shall require prior written approval by the District.

4. The permit conditions listed below shall apply to the turbine test cells/pads, duct burner test pad, and thermal oxidizers at this facility. The turbine test cells/pads, duct burner test pad, and thermal oxidizers are together hereinafter referred to as "test cells."

5. From the five most recent annual submittals of index values, with approved District changes, the highest distillate fuel NOx emission index (DFI) and natural gas NOx emission index (NGI) values, expressed in pounds of NOx per 1000 pounds of fuel, shall be used to calculate the cumulative NOx emissions for each calendar year and determine the maximum allowable combination of fuel usage, such that NOx emissions do not exceed the annual emission limit specified in this permit.

6. No later than June 1 of each year, the permittee shall submit to the District's emissions inventory section emission index values and supporting fuel usage data for the previous calendar year. The index values in the annual submittal shall account for any changes in NOx emission factors and test procedures based on the types and number of Engine families that were tested during the previous calendar year. The District shall review the annual submittal, make any changes necessary to the index values, and approve the index values not less than thirty days after notifying the permittee of any changes. The permittee shall maintain records of index values including approved District changes, if any, onsite for a period of five years from the date of the last use of the index values for any calculation pursuant to this permit and make the records available to the District upon request.

7. The permittee shall calculate and record the cumulative NOx emissions from the beginning of the calendar year to the end of each month within 30 calendar days of the end of that month. The cumulative NOx emissions shall be expressed in tons per year and calculated using the following equation: [((MaxDFI)*(DF)+(MaxNGI)*(NG))/2], where (DF) and (NG) are the respective cumulative fuel usages to the end of the calendar month, expressed in million pounds per calendar year, and (MaxDFI) and (MaxNGI) are the respective highest index values from the five most recent annual submittals to the District, expressed in pounds of NOx per 1000 pounds of fuel, including any District changes that were approved before the end of the calendar month. If the cumulative NOx emissions calculated pursuant to this methodology are greater than the annual NOx emissions limit specified in the permit, the District's Compliance Division shall be notified within 24 hours, in writing, and year-to-date cumulative annual NOx emissions shall be calculated from the beginning of the current calendar year to the end of each month within 30 calendar days of the end of that month using current year emissions factors and fuel usages in accordance with a protocol approved in advance by the District. These emission factors and fuel usages shall be maintained on-site and made available to District personnel upon request. For the purposes of determining compliance with the NOx emission limits specified in this permit, the District-approved emission factor/fuel usage methodology shall take precedence over any emission index methodology.

8. No later than March 1 of each year, the permittee shall calculate and record the NOx emissions for the previous calendar year, expressed in tons per year, using the following equation: [((DFI)*(DF)+(NGI)*(NG))/2]. Where (DF) and (NG) are the respective fuel usages for the previous calendar year, expressed in million pounds per calendar year, and (DFI) and (NGI) are the respective fuel index values for the previous calendar year as submitted to the District, expressed in pounds of NOx per 1000 pounds of fuel. If the District approves a change in a submitted fuel index values for a calendar year, the permittee shall recalculate and record the NOx emissions for that calendar year using the changed fuel index value(S) within 60 days of the date the District approves such a change. For the purposes of determining compliance with the NOx limits specified in this permit, the calculation methodology specified in this condition shall take precedence over any other calculation methodology specified in this permit. The records required by this condition shall be maintained for a minimum of five years and made available to the District upon request.

9. When required to determine compliance with a PM10 emissions limit stated in this permit, permittee shall calculate and record daily PM10 emissions using the following equation: [(1.16)*(DF)+(0.47)*(NG)], where (DF) and (NG) are the respective fuel usages in 1000 pounds per day.

10. When required to determine compliance with a SOx emission limit stated in this permit, permittee shall calculate and record daily SOx emissions using the following equation: [(S)(DF)+(0.03)(NG)]. Where (DF) and (NG) are the respective fuel usages in 1000 pounds per day and (S) is the weighted average sulfur content of the distillate fuel in pounds of fuel.

11. Calendar year usage of all fuels shall not cause cumulative NOx emissions to exceed 183.2 tons per calendar year.

12. When the cumulative calendar year fuel usage exceeds 1.5 million pounds of distillate or 13.5 million pounds of gaseous fuel, on any day thereafter, daily fuel usage shall not cause PM10 emissions from all test cells to exceed 493.8 pounds per day.

13. When the cumulative calendar year fuel usage exceeds 1.5 million pounds of distillate, on any day thereafter that a fuel with sulfur content greater than 0.10% by weight is used, daily fuel usage shall not cause SOx emissions from all test cells to exceed 543.8 pounds per day.

14. Permittee shall maintain supplier records of the sulfur content of the distillate fuel. Permittee shall keep daily records of fuel usage for any fuel with sulfur content greater than 0.10% by weight. If supplier records are not available, sulfur content shall be determined in accordance with a protocol approved in advance by the District.

15. Permittee shall maintain records of daily and monthly cumulative calendar usage of each type of fuel used in the test cells. All usage records shall be corrected to standard conditions.

16. A non-resettable totalizing gaseous fuel meter shall be maintained on-site to measure fuel usage. The meter shall either be self-correcting to standard conditions (68 deg F and 14.7 PSIA) or shall display meter gas pressure and temperature data.

17. At the request of the District, permittee shall provide a test cell testing schedule covering a two week period. The schedule shall be submitted within 10 calendar days of the District's request and the two week period shall begin on the date the test schedule is submitted. The schedule shall specify the type of turbines to be tested and the type of test to be performed. Any specific measurements or additional data requested by the District shall be handled at the time of the test and may include, if possible, additional emissions readings (e.g., NOx, CO, HC) taken during a given test.

18. Permittee shall maintain records of all tests performed in the test cells. The records shall include:
    -the type of equipment tested
    -operating conditions of the test
    -actual emissions if measured or the emission factor used to calculate emissions

19. Access, facilities, utilities and any necessary safety equipment for source testing and inspection shall be provided upon request of the Air Pollution Control District.

20. This Air Pollution Control District Permit does not relieve the holder from obtaining permits or authorizations required by other governmental agencies.

21. The permittee shall, upon determination of applicability and written notification by the District, comply with all applicable requirements of the Air Toxics "Hot Spots" Information and Assessment Act (California Health and Safety Code Section 44300 et seq.

Although this project consists of proposed increases to annual NOx emissions as well as daily SOx and PM_{10} emissions, hourly emissions are increased by default. There are no hourly limitations on this facility's current permit. However, the maximum hourly operating scenarios provided by the applicant and under which emissions were modeled, were intended to be very conservative estimates. The conservatism built into the estimated emissions included assumption of operation of highest fuel burning turbine operated in each test cell based on review of previous two years' test data. This resulted in an assumed natural gas fuel consumption of 73,769 lbs/hr in scenario A and 82,306 lbs/hr in scenario B, whereas the maximum measured natural gas usage within the previous two years, as per the site's natural gas meter, was 31,386 lbs/hr. Also, in addition to modeling multiple test cells along with the proposed new test cells, the modeling included background NO_2 concentrations (which should already account for existing test cell emissions). Finally, it was assumed that all test cells in operation would be firing at 100% load for a given hour. Based on this data and the reasonable acceptance that personnel and logistic limitations make simultaneous operation of all test cells unlikely, the District has determined the facility will not equal or exceed the emission rates under which it passed all modeling requirements. Therefore, no additional monitoring of emissions or fuel usage on an hourly basis will be required at this time.

Emissions Calculations

Natural Gas NOx Emissions

Hourly Fuel Usage:	73,769	lbs ng/hr	NGI:	8.9	lbs NOx/1000 lbs ng
Heating Value:	1,020	Btu/cf	EF (District):	326.4	lbs NOx/MMcf
Density:	0.04	lbs ng/cf (assuming CH4)	EF (EPA):	0.32	lbs NOx/MMBtu

NOx =	73,769	lbs ng/hr				x	8.9	lbs NOx/1000 lbs ng				=	656.54	lbs NOx/hr
=	73,769	lbs ng/hr	÷	0.04	lbs ng/cf	x	326.4	lbs NOx/MMcf				=	601.96	lbs NOx/hr
=	73,769	lbs ng/hr	÷	0.04	lbs ng/cf	x	0.32	lbs NOx/MMBtu	x	1,020	Btu/cf	=	601.96	lbs NOx/hr

Distillate Fuel NOx Emissions

Hourly Fuel Usage:	11,238	lbs df/hr	DFI:	21.38	lbs NOx/1000 lbs df
Heating Value:	139,000	Btu/gal	EF (District):	122.32	lbs NOx/1000 gal
Density:	7.1	lbs df/gal	EF (EPA):	0.88	lbs NOx/MMBtu

NOx =	11,238	lbs df/hr				x	21.38	lbs NOx/1000 lbs df				=	240.27	lbs NOx/hr
=	11,238	lbs df/hr	÷	7.10	lbs df/gal	x	122.32	lbs NOx/1000 gal				=	193.61	lbs NOx/hr
=	11,238	lbs df/hr	÷	7.10	lbs df/gal	x	0.88	lbs NOx/MMBtu	x	139,000	Btu/gal	=	193.61	lbs NOx/hr

Total NOx =	896.81	lbs NOx/hr	(using site indexes)
	795.57	lbs NOx/hr	(using emission factors)

Fuel Usage, Scenario A

Annual Emissions

Assume NOx generated by different fuels is the same ratio for annual emissions as hourly emissions.
Assume maximum NOx increase is 24.9 tons/yr.

NOx emissions from ng =	*(656.54 / 896.81) * (24.9)*	=	18.23	*tons/yr*	*(from index)*
=	*(601.96 / 795.57) * (24.9)*	=	18.84	*tons/yr*	*(from EF)*
NOx emissions from df =	*(240.27 / 896.81) * (24.9)*	=	6.67	*tons/yr*	*(from index)*
=	*(193.61 / 795.57) * (24.9)*	=	6.06	*tons/yr*	*(from EF)*

Annual Fuel Usage

annual fuel use = annual emissions (lbs/yr) / site emission index (lbs NOx/1000 lbs fuel)
= annual emissions (lbs NOx/yr) ÷ EF (lbs NOx/MMcf)

annual ng increase (index) =	*(18.23 * 2000) ÷ (8.9 / 1000)*	=	4096393	*lbs ng/yr*	÷	0.04	*lbs ng/cf*	=	102.41	*MMcf/yr*
					x	1,020	*Btu/cf*	=	104,458	*MMBtu/yr*
annual ng increase (EF) =	*(18.84 * 2000) ÷ (326.4)*	=	115.44	*MMcf/yr*						
=	*(18.84 * 2000) ÷ (0.32)*	=	117,752	*MMBtu/yr*						
annual df increase (index) =	*(6.67 * 2000) ÷ (21.38 / 1000)*	=	624046	*lbs df/yr*	÷	7.1	*lbs df/gal*	=	87,894	*gal/yr*
					x	139,000	*Btu/gal*	=	12,217	*MMBtu/yr*
annual df increase (EF) =	*(6.06 * 2000) ÷ (122.32 / 1000)*	=	99,080	*gal/yr*						
=	*(6.06 * 2000) ÷ (0.88)*	=	13,772	*MMBtu/yr*						

Hourly Fuel Usage

hourly ng usage =	73,769	*lbs ng/hr*	÷	0.04	*lbs ng/cf*	x	1,020	*Btu/cf*	=	1,881	*MMBtu/hr*		
hourly df usage =	11,238	*lbs df/hr*	÷	7.1	*lbs df/gal*				=	1.58	*kgal/hr*	=	220.0 *MMBtu/hr*

Fuel Usage, Scenario A

Daily Fuel Usage

Assume SOx and PM10 generated by different fuels is the same ratio for daily emissions as hourly emissions.
Assume maximum SOx increase is 249 lbs/day and maximum PM10 increase is 99 lbs/day.

Natural Gas

NGI (SOx) =	0.7	lbs SOx / klbs fuel
NGI (PM10) =	0.47	lbs PM10 / klbs fuel

SOx =	0.7	*lbs/klbs*	x	73,769	*lbs ng/hr*	=	51.6	*lbs/hr*
PM10 =	0.47	*lbs/klbs*	x	73,769	*lbs ng/hr*	=	34.7	*lbs/hr*

Distillate Fuel

DFI (SOx) =	2.95	lbs SOx / klbs fuel
DFI (PM10) =	1.16	lbs PM10 / klbs fuel

SOx =	2.95	*lbs/klbs*	x	11,238	*lbs df/hr*	=	33.2	*lbs/hr*
PM10 =	1.16	*lbs/klbs*	x	11,238	*lbs df/hr*	=	13.0	*lbs/hr*

Total Daily Emissions Increases

SOx emissions from ng =	*(51.6 / (51.6+33.2)) * (249)*	=	151.6	*lbs/day*
PM10 emissions from ng =	*(2.2 / (2.2+1.1)) * (99)*	=	71.9	*lbs/day*
SOx emissions from df =	*(33.2 / (51.6+33.2)) * (249)*	=	97.4	*lbs/day*
PM10 emissions from df =	*(1.1 / (2.2+1.1)) * (99)*	=	27.1	*lbs/day*

Daily Fuel Increases

daily ng increase (SOx) =	*(151.6) ÷ (0.7/1000)*	=	216.6	*klbs (ng) / day*	=	5,524	*MMBtu/day*
daily ng increase (PM10) =	*(65.7) ÷ (0.03/1000)*	=	153.1	*klbs (ng) / day*	=	3,904	*MMBtu/day*
daily df increase (SOx) =	*(97.4) ÷ (2.95/1000)*	=	33.0	*klbs (df) / day*	=	*646*	*MMBtu/day*
daily df increase (PM10) =	*(33.3) ÷ (0.1/1000)*	=	23.3	*klbs (df) / day*	=	*457*	*MMBtu/day*

Fuel Usage, Scenario A

Total Fuel Usage

Total NOx emissions = 183.2 tons/yr

NOx emissions from ng =	*(656.54 / 896.81) * 183.2*	=	134.12	*tons/yr (from index)*
NOx emissions from df =	*(240.27 / 896.81) * 183.2*	=	49.08	*tons/yr (from index)*
Total ng usage =	*(134.12 * 2000) ÷ (8.9 / 1000)*	=	3.01E+07	lbs ng/yr
	÷ 0.04 lbs ng/scf	=	7.53E+08	scf/yr
	** 1020 Btu/scf*	=	7.69E+05	MMBtu/yr
Total df usage =	*(49.08 * 2000) ÷ (21.38 / 1000)*	=	4.59E+06	lbs df/yr
	÷ 7.1 lbs df/gal	=	6.47E+05	gal/yr
	** 139,000 Btu/gal*	=	8.99E+04	MMBtu/yr

Fuel Usage, Scenario A

FROM APPLICATION:

Applicant:	Solar	Mailing Address:	
Application Number:	APCD2012-APP-001937	Equipment Address:	
Make:		Model:	S/N:
Size (MW):			

Operating Schedule: 24 hrs/day | days/wk | wks/yr | days/yr | hrs/yr

NATURAL GAS CALCULATIONS:

	Uncontrolled Emission Factors		
	lbs/MMcf	lbs/MMBtu	NGI
NOx	3.3E+02	3.2E-01	8.9
CO	8.4E+01	8.2E-02	
SOx	6.0E-01	4.7E-04	0.70
VOC	2.1E+00	2.1E-03	
PM10	6.7E+00	6.8E-03	0.47

Natural Gas Usage		
Hourly	73.8	klbs/hr
	1,881.1	MMBtu/hr
Daily	153.1	klbs/day
	3,903.6	MMBtu/day
Annual	4,096.4	klbs/yr
	104,458	MMBtu/yr

Given Hourly Emissions (NG)*	
NOx	509 lbs/hr
CO	188.7 lbs/hr
SOx	52.9 lbs/hr
VOC	56.4 lbs/hr

*From Solar Modeling Scenarios, dated 9/19/11

Notes:
1. lbs/MMcf emission factors from District website
2. lbs/MMBtu emission factors from District website as taken from AP-42, Section 3.1 (4/00 edition)
3. assume sulfur content of fuel is 0.05%
4. NOx natural gas index, lbs NOx/1000 lbs ng, taken from 2010; SOx and PM10 indexes taken from PTO

Given Fuel Usage: 1,881 MMBtu/hr | 73.8 lbs/hr | 104,458 MMBtu/yr | 4,096 klbs/yr

NOx =	73.8	klbs/hr	x	6.9E+00	lbs/klbs	=	656.8 lbs/hr
CO =	1,881	MMBtu/hr	x	8.2E-02	lbs/MMBtu	=	154.3 lbs/hr
SOx =	73.8	klbs/hr	x	7.0E-01	lbs/klbs	=	51.6 lbs/hr
VOC =	1,881	MMBtu/hr	x	2.1E-03	lbs/MMBtu	=	4.0 lbs/hr
PM10 =	73.8	klbs/hr	x	4.7E-01	lbs/klbs	=	34.7 lbs/hr
NOx =	153.1	klbs/hr	x	6.9E+00	lbs/klbs	=	1,363.0 lbs/day
CO =	3,903.6	MMBtu/hr	x	8.2E-02	lbs/MMBtu	=	320.1 lbs/day
SOx =	153.1	klbs/hr	x	7.0E-01	lbs/klbs	=	107.2 lbs/day
VOC =	3,903.6	MMBtu/hr	x	2.1E-03	lbs/MMBtu	=	8.2 lbs/day
PM10 =	153.1	klbs/hr	x	4.7E-01	lbs/klbs	=	71.9 lbs/day
NOx =	4,096	klbs/yr	x	6.9E+00	lbs/klbs	=	18.2 tons/yr
CO =	104,458	MMBtu/yr	x	8.2E-02	lbs/MMBtu	=	4.3 tons/yr
SOx =	4,096	klbs/yr	x	7.0E-01	lbs/klbs	=	1.4 tons/yr
VOC =	104,458	MMBtu/yr	x	2.1E-03	lbs/MMBtu	=	0.1 tons/yr
PM10 =	4,096	klbs/yr	x	4.7E-01	lbs/klbs	=	1.0 tons/yr

DISTILLATE FUEL CALCULATIONS:

	Uncontrolled Emission Factors		
	lbs/kgal	lbs/MMBtu	DFI
NOx	1.2E+02	8.8E-01	21.4
CO	4.6E-01	3.3E-03	
SOx	7.1E+00	5.1E-04	2.95
VOC	6.0E-02	4.1E-04	
PM10	1.6E+00	1.2E-02	1.16

Distillate Fuel Usage		
Hourly	11.2	klbs/hr
	220.0	MMBtu/hr
Daily	23.3	klbs/day
	456.6	MMBtu/day
Annual	624.0	klbs/yr
	12,217	MMBtu/yr

Given Hourly Emissions (DF)*	
NOx	229.6 lbs/hr
CO	21.2 lbs/hr
SOx	7.4 lbs/hr
VOC	56.1 lbs/hr

*From Solar Modeling Scenarios, dated 9/19/11

Notes:
1. lbs/kgal emission factors from District website
2. lbs/MMBtu emission factors from District website as taken from AP-42, Section 3.1 (4/00 edition)
3. assume sulfur content of fuel is 0.1%
4. NOx natural gas index, lbs NOx/1000 lbs ng, taken from 2010; SOx and PM10 indexes taken from PTO

Given Fuel Usage: 220 MMBtu/hr | 11.2 klbs/hr | 12,217 MMBtu/yr | 624.0 klbs/yr

NOx =	11.2	klbs/hr	x	2.1E+01	lbs/klbs	=	240.3 lbs/hr
CO =	220	MMBtu/hr	x	3.3E-03	lbs/MMBtu	=	0.7 lbs/hr
SOx =	11.2	klbs/hr	x	3.0E+00	lbs/klbs	=	33.2 lbs/hr
VOC =	220	MMBtu/hr	x	4.1E-04	lbs/MMBtu	=	0.1 lbs/hr
PM10 =	11.2	klbs/hr	x	1.2E+00	lbs/klbs	=	13.0 lbs/hr
NOx =	23.3	klbs/hr	x	2.1E+01	lbs/klbs	=	498.7 lbs/day
CO =	456.6	MMBtu/hr	x	3.3E-03	lbs/MMBtu	=	1.5 lbs/day
SOx =	23.3	klbs/hr	x	3.0E+00	lbs/klbs	=	69.8 lbs/day
VOC =	456.6	MMBtu/hr	x	4.1E-04	lbs/MMBtu	=	0.2 lbs/day
PM10 =	23.3	klbs/hr	x	1.2E+00	lbs/klbs	=	27.1 lbs/day
NOx =	624	klbs/yr	x	2.1E+01	lbs/klbs	=	6.7 tons/yr
CO =	12,217	MMBtu/yr	x	3.3E-03	lbs/MMBtu	=	0.0 tons/yr
SOx =	624	klbs/yr	x	3.0E+00	lbs/klbs	=	0.9 tons/yr
VOC =	12,217	MMBtu/yr	x	4.1E-04	lbs/MMBtu	=	0.0 tons/yr
PM10 =	624	klbs/yr	x	1.2E+00	lbs/klbs	=	0.4 tons/yr

TOTAL EMISSIONS:

	lbs/hr	lbs/day	tons/yr
NOx	838.6	1861.7	24.9
CO	209.9	321.6	4.3
SOx	60.3	176.0	2.4
VOC	112.5	8.4	0.1
PM10	47.7	99.0	1.3

Notes: 1. *Total of natural gas emissions and distillate fuel emissions.*
2. Hourly NOx, CO, SOx and VOC emissions based on Scenario A provided by the applicant.
3. *Calculated NOx, SOx, PM10 emissions based on site's current emission indexes.*
4. *Other pollutants emissions based on default emission factors from District website.*
5. *Hourly emissions based on site's estimated maximum hourly fuel usage (used in modeling).*
6. *Daily emissions based on 24 hrs of operation at estiamted maximum hourly fuel usage.*
7. *Annual emissions increase based on maximum NOx increase of 24.9 tons/yr.*

FROM APPLICATION:

001937 - emissions calculations 5.xls

Applicant: Solar

Mailing Address:

Application Number: APCD2012-APP-001937

Equipment Address:

Make: Model: S/N:

Size (MW): NG Fuel Usage: 73,769 lbs/hr DF Fuel Usage: 11,238 lbs/hr

Operating Schedule: hrs/day days/wk wks/yr days/yr hrs/yr

NATURAL GAS TOXICS CALCULATIONS:

Natural Gas Heating Value: 1,020 Btu/scf

Natural Gas Usage: 1.881 MMBtu/hr 104,458 MMBtu/yr

Natural Gas			
Compound	Emission Factor, lbs/MMBtu	Hourly Emissions, lbs/hr	Annual Emissions Increase, lbs/yr
Acetaldehyde	4.00E-05	7.52E-02	4.18E+00
Acrolein	6.40E-06	1.20E-02	6.69E-01
Benzene	1.20E-05	2.26E-02	1.25E+00
1,3-Butadiene	4.30E-07	8.09E-04	4.49E-02
Ethylbenzene	3.20E-05	6.02E-02	3.34E+00
Formaldehyde	7.10E-04	1.34E+00	7.42E+01
Naphthalene	1.30E-06	2.45E-03	1.36E-01
PAHs	2.20E-06	4.14E-03	2.30E-01
Toluene	1.30E-04	2.45E-01	1.36E+01
Xylene	6.40E-05	1.20E-01	6.69E+00

DISTILLATE FUEL TOXICS CALCULATIONS:

Diesel Heating Value: 139,000 Btu/scf

Given Fuel Usage: 1.58 kgal/hr 87.89 kgal/yr

Distillate Fuel			
Compound	Emission Factor, lbs/1000 gal	Hourly Emissions, lbs/hr	Annual Emissions Increase, lbs/yr
Arsenic	7.80E-03	1.23E-02	6.86E-01
Benzene	7.60E-03	1.20E-02	6.68E-01
1,3-Butadiene	2.20E-03	3.46E-03	1.93E-01
Cadmium	1.20E-03	1.90E-03	1.05E-01
Chromium, Hexavalent	2.00E-04	3.17E-04	1.76E-02
Copper	3.60E-03	5.70E-03	3.16E-01
Formaldehyde	3.89E-02	6.16E-02	3.42E+00
Lead	4.80E-03	7.60E-03	4.22E-01
Manganese	1.40E-03	2.22E-03	1.23E-01
Mercury	2.30E-03	3.64E-03	2.02E-01
Naphthalene	4.90E-03	7.76E-03	4.31E-01
Nickel	2.30E-03	3.64E-03	2.02E-01
PAHs	5.60E-03	8.86E-03	4.92E-01
Selenium	9.80E-03	1.55E-02	8.61E-01
Zinc	1.43E-02	2.26E-02	1.26E+00

TOTAL TOXICS EMISSIONS:

TOTAL TOXICS EMISSIONS		
Compound	Total Hourly Emissions, lbs/hr	Total Annual Emissions Increase, lbs/yr
Acetaldehyde	7.52E-02	4.18E+00
Acrolein	1.20E-02	6.69E-01
Arsenic	1.23E-02	6.86E-01
Benzene	3.46E-02	1.92E+00
1,3-Butadiene	4.29E-03	2.38E-01
Cadmium	1.90E-03	1.05E-01
Chromium, Hexavalent	3.17E-04	1.76E-02
Copper	5.70E-03	3.16E-01
Ethyl Benzene	6.02E-02	3.34E+00
Formaldehyde	1.40E+00	7.76E+01
Lead	7.60E-03	4.22E-01
Manganese	2.22E-03	1.23E-01
Mercury	5.94E-03	1.23E-01
Naphthalene	2.45E-03	3.38E-01
Nickel	3.64E-03	2.02E-01
PAHs	1.30E-02	7.22E-01
Selenium	1.55E-02	8.61E-01
Toluene	2.45E-01	1.36E+01
Xylene	1.20E-01	6.69E+00
Zinc	2.26E-02	1.26E+00

Natural Gas NOx Emissions

Hourly Fuel Usage:	82,306	lbs ng/hr	NGI:	8.9	lbs NOx/1000 lbs ng
Heating Value:	1,020	Btu/cf	EF (District):	326.4	lbs NOx/MMcf
Density:	0.04	lbs ng/cf (assuming CH4)	EF (EPA):	0.32	lbs NOx/MMBtu

NOx =	82,306	lbs ng/hr				x	8.9	lbs NOx/1000 lbs ng				=	732.52	lbs NOx/hr
=	82,306	lbs ng/hr	÷	0.04	lbs ng/cf	x	326.4	lbs NOx/MMcf				=	671.62	lbs NOx/hr
=	82,306	lbs ng/hr	÷	0.04	lbs ng/cf	x	0.32	lbs NOx/MMBtu	x	1,020	Btu/cf	=	671.62	lbs NOx/hr

Distillate Fuel NOx Emissions

Hourly Fuel Usage:	8,823	lbs df/hr	DFI:	21.38	lbs NOx/1000 lbs df
Heating Value:	139,000	Btu/gal	EF (District):	122.32	lbs NOx/1000 gal
Density:	7.1	lbs df/gal	EF (EPA):	0.88	lbs NOx/MMBtu

NOx =	8,823	lbs df/hr				x	21.38	lbs NOx/1000 lbs df				=	188.64	lbs NOx/hr
=	8,823	lbs df/hr	÷	7.10	lbs df/gal	x	122.32	lbs NOx/1000 gal				=	152.00	lbs NOx/hr
=	8,823	lbs df/hr	÷	7.10	lbs df/gal	x	0.88	lbs NOx/MMBtu	x	139,000	Btu/gal	=	152.00	lbs NOx/hr

Total NOx =	921.16	lbs NOx/hr	(using site indexes)
	823.62	lbs NOx/hr	(using emission factors)

Fuel Usage, Scenario B

Annual Emissions

Assume NOx generated by different fuels is the same ratio for annual emissions as hourly emissions.
Assume maximum NOx increase is 24.9 tons/yr.

NOx emissions from ng =	*(656.54 / 921.16) * (24.9)*	=	19.80	*tons/yr (from index)*	*(656.54/921.16)*(183.2)=*	*145.68*	*tons/yr max*
=	*(601.96 / 823.62) * (24.9)*	=	20.30	*tons/yr (from EF)*			
NOx emissions from df =	*(240.27 / 921.16) * (24.9)*	=	5.10	*tons/yr (from index)*	*(240.27/921.16)*(183.2)=*	*37.52*	*tons/yr max*
=	*(193.61 / 823.62) * (24.9)*	=	4.60	*tons/yr (from EF)*			

Annual Fuel Usage

annual fuel use = annual emissions (lbs/yr) / site emission index (lbs NOx/1000 lbs fuel)
= annual emissions (lbs NOx/yr) ÷ EF (lbs NOx/MMcf)

annual ng increase (index) =	*(18.23 * 2000) ÷ (8.9 / 1000)*	=	4449653	*lbs ng/yr*	÷	0.04	*lbs ng/cf*	=	111.24	*MMcf/yr*
					x	1,020	*Btu/cf*	=	113,466	*MMBtu/yr*
annual ng increase (EF) =	*(18.84 * 2000) ÷ (326.4)*	=	124.42	*MMcf/yr*						
=	*(18.84 * 2000) ÷ (0.32)*	=	126,903	*MMBtu/yr*						
annual df increase (index) =	*(6.67 * 2000) ÷ (21.38 / 1000)*	=	476992	*lbs df/yr*	÷	7.1	*lbs df/gal*	=	67,182	*gal/yr*
					x	139,000	*Btu/gal*	=	9,338	*MMBtu/yr*
annual df increase (EF) =	*(6.06 * 2000) ÷ (122.32 / 1000)*	=	75,138	*gal/yr*						
=	*(6.06 * 2000) ÷ (0.88)*	=	10,444	*MMBtu/yr*						

Hourly Fuel Usage

hourly ng usage =	82,306	*lbs ng/hr*	÷	0.04	*lbs ng/cf*	x	1,020	*Btu/cf*	=	2,099	*MMBtu/hr*		
hourly df usage =	8,823	*lbs df/hr*	÷	7.1	*lbs df/gal*				=	1.24	*kgal/hr*	=	172.7 *MMBtu/hr*

Fuel Usage, Scenario B

Daily Fuel Usage

Assume SOx and PM10 generated by different fuels is the same ratio for daily emissions as hourly emissions.
Assume maximum SOx increase is 249 lbs/day and maximum PM10 increase is 99 lbs/day.

Natural Gas

NGI (SOx) =	0.7	lbs SOx / klbs fuel
NGI (PM10) =	0.47	lbs PM10 / klbs fuel

SOx =	0.7	*lbs/klbs*	x	82,306	*lbs ng/hr*	=	57.6	*lbs/hr*
PM10 =	0.47	*lbs/klbs*	x	82,306	*lbs ng/hr*	=	38.7	*lbs/hr*

Distillate Fuel

DFI (SOx) =	2.95	lbs SOx / klbs fuel
DFI (PM10) =	1.16	lbs PM10 / klbs fuel

SOx =	2.95	*lbs/klbs*	x	8,823	*lbs df/hr*	=	26.0	*lbs/hr*
PM10 =	1.16	*lbs/klbs*	x	8,823	*lbs df/hr*	=	10.2	*lbs/hr*

Total Daily Emissions Increases

SOx emissions from ng =	*(51.6 / (51.6+33.2)) * (249)*	=	171.5	*lbs/day*
PM10 emissions from ng =	*(2.2 / (2.2+1.1)) * (99)*	=	78.3	*lbs/day*
SOx emissions from df =	*(33.2 / (51.6+33.2)) * (249)*	=	77.5	*lbs/day*
PM10 emissions from df =	*(1.1 / (2.2+1.1)) * (99)*	=	20.7	*lbs/day*

Daily Fuel Increases

daily ng increase (SOx) =	*(151.6) ÷ (0.7/1000)*	=	245.0	*klbs (ng) / day*	=	6,248	*MMBtu/day*
daily ng increase (PM10) =	*(65.7) ÷ (0.03/1000)*	=	166.6	*klbs (ng) / day*	=	4,248	*MMBtu/day*
daily df increase (SOx) =	*(97.4) ÷ (2.95/1000)*	=	26.3	*klbs (df) / day*	=	*514*	*MMBtu/day*
daily df increase (PM10) =	*(33.3) ÷ (0.1/1000)*	=	17.9	*klbs (df) / day*	=	*350*	*MMBtu/day*

Fuel Usage, Scenario B

Total Fuel Usage

Total NOx emissions = 183.2 tons/yr

NOx emissions from ng =	*(656.54 / 896.81) * 183.2*	=	145.68	*tons/yr (from index)*
NOx emissions from df =	*(240.27 / 896.81) * 183.2*	=	37.52	*tons/yr (from index)*

Total ng usage =	*(134.12 * 2000) ÷ (8.9 / 1000)*	=	3.27E+07	lbs ng/yr
	÷ 0.04 lbs ng/scf	=	8.18E+08	scf/yr
	** 1020 Btu/scf*	=	8.35E+05	MMBtu/yr

Total df usage =	*(49.08 * 2000) ÷ (21.38 / 1000)*	=	3.51E+06	lbs df/yr
	÷ 7.1 lbs df/gal	=	4.94E+05	gal/yr
	** 139,000 Btu/gal*	=	6.87E+04	MMBtu/yr

FROM APPLICATION:

Applicant:	Solar	*Mailing Address:*	
Application Number:	APCD2012-APP-001937	*Equipment Address:*	
Make:		*Model:*	*S/N:*
Size (MW):			
Operating Schedule:	24 *hrs/day*	*days/wk*	*wks/yr* *days/yr* *hrs/yr*

NATURAL GAS CALCULATIONS:

	Uncontrolled Emission Factors		
	lbs/MMcf	*lbs/MMBtu*	*NGI*
NOx	3.3E+02	3.2E-01	8.9
CO	8.4E+01	8.2E-02	
SOx	6.0E-01	4.7E-04	0.70
VOC	2.1E+00	2.1E-03	
PM10	6.7E+00	6.6E-03	0.47

Natural Gas Usage		
Hourly	82.3	*klbs/hr*
	2,099	*MMBtu/hr*
Daily	166.6	*klbs/day*
	4,248	*MMBtu/day*
Annual	4,450	*klbs/yr*
	113,466	*MMBtu/yr*

Given Hourly Emissions (NG)*		
NOx	530.7	lbs/hr
CO	165.6	lbs/hr
SOx	51.2	lbs/hr
VOC	0.3	lbs/hr

*From Solar Modeling Scenarios, dated 9/19/11

Notes: 1. *lbs/MMcf emission factors from District website*
2 *lbs/MMBtu emission factors from District website as taken from AP-42, Section 3.1 (4/00 edition)*
3 *assume sulfur content of fuel is 0.05%*
4 *natural gas index, lbs NOx/1000 lbs ng, taken from 2010*

Given Fuel Usage: 1,881 *MMBtu/hr* 73.8 *klbs/hr* 104,456 *MMBtu/yr* 4,096 *klbs/yr*

NOx =	82.3	*klbs/hr*	x	8.9E+00	*lbs/klbs* =	732.8	*lbs/hr*
CO =	2,099	*MMBtu/hr*	x	8.2E-02	*lbs/MMBtu =*	172.1	*lbs/hr*
SOx =	82.3	*klbs/hr*	x	7.0E-01	*lbs/klbs* =	57.6	*lbs/hr*
VOC =	2,099	*MMBtu/hr*	x	2.1E-03	*lbs/MMBtu =*	4.4	*lbs/hr*
PM10 =	82.3	*klbs/hr*	x	4.7E-01	*lbs/klbs* =	38.7	*lbs/hr*
NOx =	166.6	*klbs/day*	x	8.9E+00	*lbs/klbs* =	1,483.1	*lbs/day*
CO =	4,247.5	*MMBtu/day*		8.2E-02	*lbs/MMBtu =*	348.3	*lbs/day*
SOx =	166.6	*klbs/day*	x	7.0E-01	*lbs/klbs* =	116.6	*lbs/day*
VOC =	4,247.5	*MMBtu/day*		2.1E-03	*lbs/MMBtu =*	8.9	*lbs/day*
PM10 =	166.6	*klbs/day*	x	4.7E-01	*lbs/klbs* =	78.3	*lbs/day*
NOx =	4,450	*klbs/yr*	x	8.9E+00	*lbs/klbs* =	19.8	*tons/yr*
CO =	113,466	*MMBtu/yr*	x	8.2E-02	*lbs/MMBtu =*	4.7	*tons/yr*
SOx =	4,450	*klbs/hr*	x	7.0E-01	*lbs/klbs* =	1.6	*tons/yr*
VOC =	113,466	*MMBtu/yr*	x	2.1E-03	*lbs/MMBtu =*	0.1	*tons/yr*
PM10 =	4,450	*klbs/hr*	x	4.7E-01	*lbs/klbs* =	1.0	*tons/yr*

DISTILLATE FUEL CALCULATIONS:

	Uncontrolled Emission Factors		
	lbs/kgal	*lbs/MMBtu*	*DFI*
NOx	1.2E+02	8.6E-01	21.4
CO	4.6E-01	3.3E-03	
SOx	7.1E+00	5.1E-04	2.95
VOC	6.0E-02	4.1E-04	
PM10	1.6E+00	1.2E-02	1.16

Distillate Fuel Usage		
Hourly	8.8	*klbs/hr*
	173	*MMBtu/hr*
Daily	17.9	*klbs/day*
	350	*MMBtu/day*
Annual	477.0	*klbs/yr*
	9,338	*MMBtu/yr*

Given Hourly Emissions (DF)*		
NOx	60.6	lbs/hr
CO	13.8	lbs/hr
SOx	5.8	lbs/hr
VOC	44.1	lbs/hr

*From Solar Modeling Scenarios, dated 9/19/11

Notes: 1 *lbs/kgal emission factors from District website*
2 *lbs/MMBtu emission factors from District website as taken from AP-42, Section 3.1 (4/00 edition)*
3 *assume sulfur content of fuel is 0.05%*
4 *distillate fuel index, lbs NOx/1000 lbs df, taken from 2010*

Given Fuel Usage: 173 *MMBtu/hr* 11.2 *klbs/hr* 12,217 *MMBtu/yr* 824.0 *klbs/yr*

NOx =	8.8	*klbs/hr*	x	2.1E+01	*lbs/klbs* =	188.7	*lbs/hr*
CO =	173	*MMBtu/hr*	x	3.3E-03	*lbs/MMBtu =*	0.6	*lbs/hr*
SOx =	8.8	*klbs/hr*	x	3.0E+00	*lbs/klbs* =	26.0	*lbs/hr*
VOC =	173	*MMBtu/hr*	x	4.1E-04	*lbs/MMBtu =*	0.1	*lbs/hr*
PM10 =	8.8	*klbs/hr*	x	1.2E+00	*lbs/klbs* =	10.2	*lbs/hr*
NOx =	17.9	*klbs/day*	x	2.1E+01	*lbs/klbs* =	381.8	*lbs/day*
CO =	349.6	*MMBtu/day*		3.3E-03	*lbs/MMBtu =*	1.2	*lbs/day*
SOx =	17.9	*klbs/day*	x	3.0E+00	*lbs/klbs* =	52.7	*lbs/day*
VOC =	349.6	*MMBtu/day*		4.1E-04	*lbs/MMBtu =*	0.1	*lbs/day*
PM10 =	17.9	*klbs/day*	x	1.2E+00	*lbs/klbs* =	20.7	*lbs/day*
NOx =	477	*klbs/yr*	x	2.1E+01	*lbs/klbs* =	5.1	*tons/yr*
CO =	9,338	*MMBtu/yr*	x	3.3E-03	*lbs/MMBtu =*	0.0	*tons/yr*
SOx =	477	*klbs/yr*	x	3.0E+00	*lbs/klbs* =	0.7	*tons/yr*
VOC =	9,338	*MMBtu/yr*	x	4.1E-04	*lbs/MMBtu =*	0.0	*tons/yr*
PM10 =	477	*klbs/yr*	x	1.2E+00	*lbs/klbs* =	0.3	*tons/yr*

Criteria Pollutants, Scenario B

TOTAL EMISSIONS:

	lbs/hr	lbs/day	tons/yr
NOx	569.3	1864.9	24.9
CO	179.4	349.4	4.7
SOx	57.0	169.3	2.3
VOC	44.4	9.1	0.1
PM10	48.9	99.0	1.3

Notes: 1. *Total of natural gas emissions and distillate fuel emissions.*
2. Hourly NOx, CO, SOx and VOC emissions based on Scenario A provided by the applicant
3. *Calculated NOx, SOx, PM10 emissions based on site's current emission indexes.*
4. *Other pollutants emissions based on default emission factors from District website.*
5. *Hourly emissions based on site's estimated maximum hourly fuel usage (used in modeling).*
6. *Daily emissions based on 24 hrs. of operation at estiamted maximum hourly fuel usage.*
7. *Annual emissions increase based on maximum NOx increase of 24.9 tons/yr.*

FROM APPLICATION:

Applicant: Solar

Mailing Address:

Application Number: APCD2012-APP-001937

Equipment Address:

Make:

Model:

S/N:

Size (MW):

NG Fuel Usage: 82,306 *lbs/hr*

DF Fuel Usage: 0.823 *lbs/hr*

Operating Schedule: *hrs/day* *days/wk* *wks/yr* *days/yr* *hrs/yr*

NATURAL GAS TOXICS CALCULATIONS:

Natural Gas Heating Value: 1,020 *Btu/scf*

Natural Gas Usage: 2,099 *MMBtu/hr* 113,466 *MMBtu/yr*

Natural Gas			
Compound	Emission Factor, lbs/MMBtu	Hourly Emissions, lbs/hr	Annual Emissions Increase, lbs/yr
Acetaldehyde	4.00E-05	8.40E-02	4.54E+00
Acrolein	6.40E-06	1.34E-02	7.26E-01
Benzene	1.20E-05	2.52E-02	1.36E+00
1,3-Butadiene	4.30E-07	9.02E-04	4.88E-02
Ethylbenzene	3.20E-05	6.72E-02	3.63E+00
Formaldehyde	7.10E-04	1.49E+00	8.06E+01
Naphthalene	1.30E-06	2.73E-03	1.48E-01
PAHs	2.20E-06	4.62E-03	2.50E-01
Toluene	1.30E-04	2.73E-01	1.48E+01
Xylene	6.40E-05	1.34E-01	7.26E+00

DISTILLATE FUEL TOXICS CALCULATIONS:

Diesel Heating Value: 139,000 *Btu/scf*

Given Fuel Usage: 1.24 *kgal/hr* 67.18 *kgal/yr*

Distillate Fuel			
Compound	Emission Factor, lbs/1000 gal	Hourly Emissions, lbs/hr	Annual Emissions Increase, lbs/yr
Arsenic	7.80E-03	9.69E-03	5.24E-01
Benzene	7.60E-03	9.44E-03	5.11E-01
1,3-Butadiene	2.20E-03	2.73E-03	1.48E-01
Cadmium	1.20E-03	1.49E-03	8.06E-02
Chromium, Hexavalent	2.00E-04	2.49E-04	1.34E-02
Copper	3.60E-03	4.47E-03	2.42E-01
Formaldehyde	3.89E-02	4.83E-02	2.61E+00
Lead	4.80E-03	5.96E-03	3.22E-01
Manganese	1.40E-03	1.74E-03	9.41E-02
Mercury	2.30E-03	2.86E-03	1.55E-01
Naphthalene	4.90E-03	6.09E-03	3.29E-01
Nickel	2.30E-03	2.86E-03	1.55E-01
PAHs	5.60E-03	6.96E-03	3.76E-01
Selenium	9.80E-03	1.22E-02	6.58E-01
Zinc	1.43E-02	1.78E-02	9.61E-01

TOTAL TOXICS EMISSIONS:

TOTAL TOXICS EMISSIONS		
Compound	Total Hourly Emissions, lbs/hr	Total Annual Emissions Increase, lbs/yr
Acetaldehyde	8.40E-02	4.54E+00
Acrolein	1.34E-02	7.26E-01
Arsenic	9.69E-03	5.24E-01
Benzene	3.46E-02	1.87E+00
1,3-Butadiene	3.64E-03	1.97E-01
Cadmium	1.49E-03	8.06E-02
Chromium, Hexavalent	2.49E-04	1.34E-02
Copper	4.47E-03	2.42E-01
Ethyl Benzene	6.72E-02	3.63E+00
Formaldehyde	1.54E+00	8.32E+01
Lead	5.96E-03	3.22E-01
Manganese	1.74E-03	9.41E-02
Mercury	5.16E-03	9.41E-02
Naphthalene	2.73E-03	3.02E-01
Nickel	2.86E-03	1.55E-01
PAHs	1.16E-02	6.26E-01
Selenium	1.22E-02	6.58E-01
Toluene	2.73E-01	1.48E+01
Xylene	1.34E-01	7.26E+00
Zinc	1.78E-02	9.61E-01

EMISSION INDEXES:

Year	NOx Emissions ng lbs NOx/yr	Fuel Usage ng lbs fuel/yr	NOx Emissions d lbs NOx/yr	Fuel Usage d lbs fuel/yr	ngi lbs NOx/1000 lbs ng	dfi lbs NOx/1000 lbs d
2007	128,112	17,812,980	46,670	2,967,408	7.19	15.73
2008	153,845	27,049,914	43,266	3,473,590	5.69	12.46
2009	152,168	22,765,590	36,610	2,319,876	6.68	15.78
2010	197,417	22,172,310	46,936	2,194,863	8.90	21.38
2011						

	natural gas, lbs/klbs	distillate fuel, lbs/klbs
SOx	0.7	2.95
PM10	0.47	1.16

*s = weighted average sulfur content of distillate fuel used, assume 0.1% by weight

Emission Indexes

CRITERIA POLLUTANT SUMMARY:

	Scenario A			Scenario B			Combined A and B
	lbs/hr	lbs/day	tons/yr	lbs/hr	lbs/day	tons/yr	tons/yr
NOx	838.6	1,861.7	24.9	589.3	1,864.9	24.9	24.9
CO	209.9	321.6	4.3	179.4	349.4	4.7	4.5
SOx	80.3	176.0	2.4	57.0	169.3	2.3	2.3
VOC	112.5	8.4	0.1	44.4	9.1	0.1	0.1
PM_{10}	47.7	99.0	1.3	48.9	99.0	1.3	1.3

TOXICS SUMMARY:

	Scenario A				Scenario B				Combined A and B	
	Natural Gas		Distillate Fuel		Natural Gas		Distillate Fuel		Natural Gas	Distillate Fuel
Compound	lbs/hr	lbs/yr	lbs/hr	lbs/yr	lbs/hr	lbs/yr	lbs/hr	lbs/yr	lbs/yr	lbs/yr
Acetaldehyde	7.52E-02	4.18E+00			8.40E-02	4.54E+00			4.36E+00	
Acrolein	1.20E-02	6.69E-01			1.34E-02	7.26E-01			6.97E-01	
Arsenic			1.23E-02	6.66E-01			9.69E-03	5.24E-01		6.05E-01
Benzene	2.26E-02	1.25E+00	1.20E-02	6.68E-01	2.52E-02	1.36E+00	9.44E-03	5.11E-01	1.31E+00	5.89E-01
1,3-Butadiene	8.09E-04	4.49E-02	3.48E-03	1.93E-01	9.02E-04	4.88E-02	2.73E-03	1.48E-01	4.69E-02	1.71E-01
Cadmium			1.90E-03	1.05E-01			1.49E-03	8.06E-02		9.30E-02
Chromium, Hexavalent			3.17E-04	1.76E-02			2.49E-04	1.34E-02		1.55E-02
Copper			5.70E-03	3.16E-01			4.47E-03	2.42E-01		2.79E-01
Ethyl Benzene	6.02E-02	3.34E+00			6.72E-02	3.63E+00			3.49E+00	
Formaldehyde	1.34E+00	7.42E+01	6.16E-02	3.42E+00	1.49E+00	8.06E+01	4.83E-02	2.61E+00	7.74E+01	3.02E+00
Lead			7.60E-03	4.22E-01			5.96E-03	3.22E-01		3.72E-01
Manganese			2.22E-03	1.23E-01			1.74E-03	9.41E-02		1.09E-01
Mercury			3.64E-03	2.02E-01			2.86E-03	1.55E-01		1.78E-01
Naphthalene	2.45E-03	1.36E-01	7.76E-03	4.31E-01	2.73E-03	1.48E-01	6.09E-03	3.29E-01	1.42E-01	3.80E-01
Nickel			3.64E-03	2.02E-01			2.86E-03	1.55E-01		1.78E-01
PAHs	4.14E-03	2.30E-01	8.86E-03	4.92E-01	4.62E-03	2.50E-01	6.96E-03	3.76E-01	2.40E-01	4.34E-01
Selenium			1.55E-02	8.61E-01			1.22E-02	6.58E-01		7.60E-01
Toluene	2.45E-01	1.36E+01			2.73E-01	1.48E+01			1.42E+01	
Xylene	1.20E-01	6.69E+00			1.34E-01	7.26E+00			6.97E+00	
Zinc			2.26E-02	1.26E+00			1.78E-02	9.61E-01		1.11E+00
Totals	1.88E+00	1.04E+02	1.69E-01	9.40E+00	2.10E+00	1.13E+02	1.33E-01	7.18E+00	1.09E+02	6.29E+00

Total Hourly, A = 2.05E+00 lbs/hr
Total Hourly, B = 2.23E+00 lbs/hr

Total Annual TACs = 1.17E+02 lbs/yr
= 5.85E-02 tons/yr

Applicant Data						
Test Cell	Turbine Model	EI, NOx lbs/klbs	EI, CO lbs/klbs	EI, VOC lbs/klbs	EI, SOx lbs/klbs	EF, PM10 lbs/MMBtu
20	Titan 130	20.52	2.5	0.72	0.004	6.60E-03
24	Titan 250+	1.31	0.57	0.3	0.004	6.60E-03
25	Titan 250+	30.5	2.83	0.91	0.004	6.60E-03
26	Titan 130	20.53	2.5	0.72	0.004	6.60E-03

Notes: Data for each test cell assumed the use of a specific model turbine
Fuel rate provided by the applicant for each specific test cell
EI = emission index as provided by the applicant for each specific test cell
EF = emission factor from District website

Hourly Emissions						
Test Cell	Fuel Rate lbs/hr	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr
20	6,784	139.2	17.0	4.9	0.027	0.045
24	12,454	16.3	7.1	3.7	0.050	0.082
25	9,364	285.6	26.5	8.5	0.037	0.062
26	6,851	140.7	17.1	4.9	0.027	0.045

Notes: PM10 emissions based on a fuel density of 0.04 lbs/cf and a heating value of 1020 BTU/cf

Daily Emissions						
Test Cell	Fuel Rate klbs/hr	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr
20	6,784	139.2	17.0	4.9	0.027	0.045
24	12,454	16.3	7.1	3.7	0.050	0.082
25	9,364	285.6	26.5	8.5	0.037	0.062
26	6,851	140.7	17.1	4.9	0.027	0.045

Annual Emissions						
Test Cell	Fuel Rate klbs/hr	NOx tons/yr	CO tons/yr	VOC tons/yr	SOx tons/yr	PM10 tons/yr
20	236.6	4.9	0.6	0.2	0.0	0.0
24	12,454.0	16.3	7.1	3.7	0.0	0.1
25	9,364.0	285.6	26.5	8.5	0.0	0.1
26	6,851.0	140.7	17.1	4.9	0.0	0.0

From 40 CFR 98:

Natural Gas Data

HHV:	1020	Btu/scf			
EF CO_2:	53.02	kg CO_2/MMBtu	=	116.9091	lbs CO_2/MMBtu
EF CH_4:	1.00E-03	kg CH_4/MMBtu	=	0.002205	lbs CH_4/MMBtu
EF N_2O:	1.00E-04	kg N_2O/MMBtu	=	0.0002205	lbs N_2O/MMBtu

Distillate Fuel Data

HHV:	139,000	Btu/gal			
EF CO_2:	73.96	kg CO_2/MMBtu	=	163.0818	lbs CO_2/MMBtu
EF CH_4:	3.00E-03	kg CH_4/MMBtu	=	0.006615	lbs CH_4/MMBtu
EF N_2O:	6.00E-04	kg N_2O/MMBtu	=	0.001323	lbs N_2O/MMBtu

Global Warming Potential

CO_2	1
CH_4	21
N_2O	310

Scenario A:

annual ng usage: 7.53E+08 scf/yr
annual df usage: 6.47E+05 gal/yr

annual emissions = (1E-3)*(fuel usage)*(HHV)*(EF) (* GWP ==> CO_2 equivalent)

CO_2 from ng =	44,925	tons/yr	* 1 ==>	44,925	CO_2e tons/yr
CH_4 from ng =	0.85	tons/yr	* 21 ==>	18	CO_2e tons/yr
N_2O from ng =	0.08	tons/yr	* 310 ==>	26	CO_2e tons/yr
CO_2 from df =	7,330	tons/yr	* 1 ==>	7,330	CO_2e tons/yr
CH_4 from df =	0.30	tons/yr	* 21 ==>	6	CO_2e tons/yr
N_2O from df =	0.06	tons/yr	* 310 ==>	18	CO_2e tons/yr

Total CO_2e = 52,323 tons/yr for Scenario A

Scenario B:

Annual ng usage: 8.18E+08 scf/yr
Annual df usage: 4.94E+05 gal/yr

annual emissions = (1E-3)*(fuel usage)*(HHV)*(EF) (* GWP ==> CO_2 equivalent)

CO_2 from ng =	48,799	tons/yr	* 1 ==>	48,799	CO_2e tons/yr
CH_4 from ng =	0.92	tons/yr	* 21 ==>	19	CO_2e tons/yr
N_2O from ng =	0.09	tons/yr	* 310 ==>	29	CO_2e tons/yr
CO_2 from df =	5,602	tons/yr	* 1 ==>	5,602	CO_2e tons/yr

CH_4 from df =	0.23	tons/yr	* 21 ==>	5	CO_2e tons/yr
N_2O from df =	0.05	tons/yr	* 310 ==>	14	CO_2e tons/yr
Total CO_2e =	54,468	tons/yr	for Scenario B		

Over a one-year period, assume the equipment is operated half the time under Scenario A and half the time under Scenario B.

Total Annual CO_2e = 53,396 tons/yr

Air Quality Impact Analysis

April 24, 2012

To: Arthur Carbonell
Mechanical Engineering Section

From: Ralph DeSiena
Monitoring and Technical Services Section

Subject: Solar Turbines, Application APCD-2012-APP-001937

I have completed an Air Quality Impact Analysis (AQIA) for the proposed annual fuel increase at the Solar Turbines facility, which includes 35 test cells capable of testing multiple engine types with varying emissions and emission release parameters. The facility is located at 4200 Ruffin Road, San Diego, CA. Emission increases for NOx and CO, as calculated for the proposed fuel increase by District engineering staff, triggered the District's AQIA requirements per Rule 20.3. The emission increase for NOx shall not exceed 24.9 tons/year.

Dispersion modeling was performed to determine the predicted project impacts on the Federal and California NO_2 and CO air quality standards.

EPA's AERMOD model was used to determine maximum predicted NO_2 and CO predicted concentrations in the project vicinity. Emission release parameters for the test cells, as provided by the applicant and their consultant (Scientific Resources Associated), along with the total emission for NOx and CO for each cell, were used in the modeling performed. Three operating scenarios, two for short term impacts and one for annual, were modeled. The scenarios were determined from the review of what engines have been typically tested in each of the test cells over the past 18 months. The largest model engine that was tested in each cell was used in the modeling for that cell. Total emissions for each engine were modeled, not just emissions associated with the fuel increase requested. Scenario A included 18 test cells and Scenario B included 17 test cells. The annual scenario included all 35 test cells with the Scenario A and B test cells alternating 2 hours on and 2 hours off during each day.

EPA's AERMOD model was used to determine maximum predicted NO_2 and CO concentrations in the project vicinity. The modeling was performed in accordance with EPA guidance and District standard procedures. The Plume Volume Molar Ratio Method (PVMRM) was used to determine both hourly and annual NO_2 impacts. Three (3) years of monitored Ozone data from the District's Kearny Mesa monitoring station were used for this purpose. All other Regulatory default settings were used. The receptor grid was sufficiently dense to identify maximum impacts. Receptor elevations and controlling hill heights were determined using EPA's AERMAP model.

Receptors were placed along the facility property line and the receptor grid surrounding the facility was sufficiently dense to identify maximum impacts.

Meteorological data used for EPA's AERMOD model consisted of the following data for the 2003 through 2005 time period. The data was processed by the District using EPA's AERMET meteorological data processor to produce AERMOD ready files.

- Wind speed, wind direction, standard deviation of the horizontal wind direction and temperature from the District's Kearny Mesa monitoring station.

- Twice-daily upper-air soundings from Miramar Marine Corps Air Station, San Diego, CA.
- Cloud height and total opaque cloud amount from Montgomery Field, San Diego, CA.
- Wind speed, wind direction and temperature data from Montgomery Field, San Diego, CA for replacement of missing data in the Camp Pendleton data set.
- Wind speed, wind direction and temperature data with height from the District's wind profiler with RASS located near the Miramar Marine Corps Air Station, San Diego, CA.
- Monthly values for Surface Roughness, Albedo and Bowen Ratio for the Kearny Mesa meteorological tower and project vicinity were determined using the Aersurface program.

A data post processing program included in the new version (12060) of AERMOD was used to perform a refined analysis of the facility NO_2 predicted impacts. This program adds the predicted hour by hour impacts to the monitored background value for that hour for each receptor. The highest combination of predicted plus background concentration at any receptor during the 3 years modeled is compared to the California 1-Hour standard for determination of compliance. Per the form of the Federal standard, for each modeled year the highest daily combination of predicted plus background concentration at each receptor is first determined. The 98th percentile value (8th high) can then be calculated for each receptor for each of the three years. A three year average 98th percentile value for each receptor is then determined. The highest three year average 98th percentile value at any receptor can then be compared to the Federal 1-Hour standard to determine compliance with this standard. The results of the refined 1-Hour NO_2 modeling for Scenarios A and B, including worst-case monitored background concentrations, are summarized in Table 1 and 2 below. The results of the refined NO_2 modeling for the Annual Scenario, including worst-case monitored background concentrations, are summarized in Table 3 below.

Table 1
Scenario A Predicted Maximum Ambient NO_2 Concentrations And Air Quality Standards

Average Period	Total Impact (Predicted plus Background) $\mu g/m^3$	California Standard $\mu g/m^3$	Federal Standard $\mu g/m^3$
[1]1-Hour 98th Percentile	183	N/A	188
1-Hour	323	339	N/A

[1] 3-Year average of the 98th percentile of the daily maximum 1-Hour average for each receptor

Table 2
Scenario B Predicted Maximum Ambient NO_2 Concentrations And Air Quality Standards

Average Period	Total Impact (Predicted plus Background) μg/m³	California Standard μg/m³	Federal Standard μg/m³
[1]1-Hour 98th Percentile	173	N/A	188
1-Hour	247	339	N/A

[1] 3-Year average of the 98th percentile of the daily maximum 1-Hour average for each receptor

Table 3
Annual Scenario Predicted Maximum Ambient NO_2 Concentrations And Air Quality Standards

Average Period	Total Impact (Predicted plus Background) μg/m³	California Standard μg/m³	Federal Standard μg/m³
Annual	43	57	100

The results of refined CO modeling for Scenarios A and B, including worst-case monitored background concentrations, are summarized in Tables 4 and 5 below.

Table 4
Scenario A Predicted Maximum Ambient CO Concentrations And Air Quality Standards

Average Period	Predicted Impact μg/m³	Background μg/m³	Total Impact μg/m³	California Standard μg/m³	Federal Standard μg/m³
1-Hour	162	4580	4742	23,000	40,000
8-Hour	75	3207	3282	10,000	10,000

Table 5
Scenario B Predicted Maximum Ambient CO Concentrations And Air Quality Standards

Average Period	Predicted Impact μg/m³	Background μg/m³	Total Impact μg/m³	California Standard μg/m³	Federal Standard μg/m³
1-Hour	141	4580	4721	23,000	40,000
8-Hour	71	3207	3278	10,000	10,000

Based upon the results above, the proposed annual fuel increase at the Solar Turbines facility will not result in a violation of any California or Federal Ambient Air Quality Standard.

Health Risk Assessment

Internal Memo

Rule 1200 Health Risk Assessment

Facility ID:	01130
Application:	**001938**
Project Engineer:	Arthur Carbonell
Toxics Risk Analyst:	Michael Kehetian
Date Submitted to Toxics:	04/19/12
Date Completed by Toxics:	05/02/12
HRA Tools Used:	BEEST-AERMOD (Version 09292) / HARP (Version 1.4e)

The following estimated risks are valid only for the input data provided by the Project Engineer.

The evaluation consists of four natural gas and diesel fired test cells in addition to a facility wide net fuel increase.

Estimated Risk Levels:

Maximum Individual Cancer Risk (Worker)	0.07 in one million LCP
Chronic Noncancer Health Hazard Index	≤ 1
Acute Health Hazard Index (*PMI)	= 0.34
*Point of Maximum Impact	
Sub-Chronic Lead Exposure Risk	< 0.12 ug/m^3 (ARB Standard)

Worst-Case Potential Emissions:

Both Scenario A and B hourly emissions were evaluated for the acute hazard index (Scenario A worst-case) and the combined A and B annual emissions for cancer risk and the chronic hazard index.

	Scenario A				Scenario B				Combined A and B	
	Natural Gas		Distillate Fuel		Natural Gas		Distillate Fuel		Natural Gas	Distillate Fuel
Chemical	lbs/hr	lbs/yr	lbs/hr	lbs/yr	lbs/hr	lbs/yr	lbs/hr	lbs/yr	lbs/yr	lbs/yr
Acetaldehyde	7.52E-02	4.18E+00			8.40E-02	4.54E+00			4.36E+00	
Acrolein	1.20E-02	6.69E-01			1.34E-02	7.26E-01			6.97E-01	
Arsenic			1.23E-02	6.86E-01			9.69E-03	5.24E-01		6.05E-01
Benzene	2.26E-02	1.25E+00	1.20E-02	6.66E-01	2.52E-02	1.36E+00	9.44E-03	5.11E-01	1.31E+00	5.89E-01
1,3-Butadiene	8.09E-04	4.49E-02	3.48E-03	1.93E-01	9.02E-04	4.88E-02	2.73E-03	1.48E-01	4.69E-02	1.71E-01
Cadmium			1.90E-03	1.05E-01			1.49E-03	8.06E-02		9.30E-02
Chromium, Hexavalent			3.17E-04	1.76E-02			2.49E-04	1.34E-02		1.55E-02
Copper			5.70E-03	3.16E-01			4.47E-03	2.42E-01		2.79E-01
Ethyl Benzene	6.02E-02	3.34E+00			6.72E-02	3.63E+00			3.49E+00	
Formaldehyde	1.34E+00	7.42E+01	6.16E-02	3.42E+00	1.49E+00	8.06E+01	4.83E-02	2.61E+00	7.74E+01	3.02E+00
Lead			7.60E-03	4.22E-01			5.96E-03	3.22E-01		3.72E-01
Manganese			2.22E-03	1.23E-01			1.74E-03	9.41E-02		1.09E-01
Mercury			3.64E-03	2.02E-01			2.86E-03	1.55E-01		1.78E-01
Naphthalene	2.45E-03	1.36E-01	7.76E-03	4.31E-01	2.73E-03	1.48E-01	6.09E-03	3.29E-01	1.42E-01	3.80E-01
Nickel			3.64E-03	2.02E-01			2.86E-03	1.55E-01		1.78E-01
PAHs, Treated as B(a)P	4.14E-03	2.30E-01	8.86E-03	4.92E-01	4.62E-03	2.50E-01	6.96E-03	3.76E-01	2.40E-01	4.34E-01
Selenium			1.55E-02	8.61E-01			1.22E-02	6.58E-01		7.60E-01
Toluene	2.45E-01	1.36E+01			2.73E-01	1.48E+01			1.42E+01	
Xylene	1.20E-01	6.69E+00			1.34E-01	7.26E+00			6.97E+00	

Release Parameters:

For the 35 exhaust point sources modeled, Test Cell 13A was used (assumed all emissions released via a single stack) to evaluate health impacts. Test Cell 13A is centered within the majority of the exhaust points and is among the shortest stacks having a lower bound temperature and mid range exhaust velocity.

Test Cell / Pad (Source Name)	Stack Height (Meters)	Stack Diameter (Meters)	Stack Temperature (Deg. K)	Exit Velocity (Meters/Second)
DEVTO	15.24	3.51	1088.7	22.9
KM161	13.72	1.83	753.2	12.4
KM162	14.02	1.22	753.2	78.7
KM163	13.72	1.98	753.2	34.4
KM164	11.89	0.91	753.2	73.6
TC23	22.25	2.75	753.2	18.6
TCELL01	15.32	1.83	757.6	14.7
TCELL02	15.32	1.83	758.2	18.5
TCELL03	15.32	1.83	717.6	18.3
TCELL04	15.32	1.83	754.8	18.5
TCELL05	16.82	1.83	782.6	12.4
TCELL06	15.85	1.83	753.7	18.4
TCELL07	15.85	1.83	725.4	18.5
TCELL08	15.85	1.83	717.6	18.5
TCELL09	16.41	2.13	782.0	16.2
TCELL10	18.97	3.15	753.2	14.2
TCELL11	14.63	1.86	753.2	22.1

TCELL12A	16.15	2.23	717.6	10.6
TCELL12B	16.15	2.23	753.7	3.7
TCELL13A	**7.32**	**1.83**	**717.6**	**22.9**
TCELL13B	7.32	1.83	753.7	22.9
TCELL20	8.53	1.83	750.4	18.6
TCELL21	8.53	1.83	753.2	42.2
TCELL22	20.42	3.44	753.2	15.4
TCELL24	20.42	3.44	750.4	20.4
TCELL25	20.42	3.44	750.4	14.9
TCELL26	20.42	3.44	750.4	11.3
TO1	15.09	3.51	1088.7	22.9
TO250	18.29	3.51	1088.7	22.9
TPAD14	15.09	2.58	772.0	20.9
TPAD15	15.09	2.58	624.3	20.9
TPAD16	15.09	2.58	624.3	20.9
TPAD17	15.09	2.58	770.9	16.6
TPAD18	15.09	2.58	633.2	27.4
TPAD19	15.09	2.58	753.7	20.9

Discussion

The HRA was conducted in accordance with EPA and OEHHA guidance and District standard procedures. Point sources were modeled with refined air dispersion modeling using EPA's AERMOD model, AERMET (Version 06341) processed Kearny Mesa 2003-2005 meteorology data, AERMAP terrain processing, and rural dispersion coefficients. Building downwash effects were calculated using the EPA BPIP-Prime model. The receptor grid was sufficiently dense to identify maximum impacts.

An occupational Ground Level Concentration (GLC) adjustment factor was appropriately applied based on source emissions of 8 hours per day and 5 days a week.