

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

PERMIT SERVICES DIVISION

DRAFT Permit Evaluation and Emission Calculations

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APPLICATION 8524	DATE 1/08/04
PROCESSING ENGINEER DENNIS T. JANG	

**City of Richmond; Plant #15756
401 27th Street, Richmond CA 94804**

BACKGROUND

The City of Richmond is applying for an Authority to Construct and Permit to Operate for one **Capstone C60 MicroTurbine** that will be installed and operated at a municipal building complex. The turbine will be used to generate electricity. Because the turbine will be located within 1000 feet of the outer boundary of a K-12 school and will emit hazardous air pollutants, the public notification requirements of Regulation 2-1-412 will apply. The regulation states:

- 2-1-412 Public Notice, Schools:** Prior to approving an application for an authority to construct or permit to operate for a new or modified source located within 1000 feet of the outer boundary of a K-12 schoolsite and which results in the increase in emissions of any substance into the ambient air which has been identified by the California Air Resources Board or the APCO as a toxic air contaminant or a hazardous air contaminant or which is on the list required to be prepared pursuant to subdivision (a) of Section 25532 or Section 44321 subsections (a) to (f) inclusive of the Health and Safety Code, the APCO shall:
- 412.1 Prepare a public notice in which the proposed new or modified source and the proposed emissions are fully described.
 - 412.2 Distribute the notice, prepared in accordance with subsection 2-1-412.1 at the expense of the applicant, to the parents or guardians of children enrolled in any school within one-quarter mile of the source and to each address within a radius of 1000 feet of the source. This notice shall be distributed at least 30 days prior to the date final action on the application is to be taken by the APCO. The APCO shall review and consider all comments received during the 30 days after the notice is distributed, and shall include written responses to the comments in the permit application file prior to taking final action on the application.
 - 412.3 Failure of any person to receive the notice shall not affect the validity of the authority to construct or permit to operate issued by the APCO, if the APCO or applicant responsible for giving the notice has made a good faith effort to follow the procedures for giving the notice prescribed by law.

(Adopted 11/1/89; Amended 10/7/98; 5/17/00)

According to the District school database, there are two schools located within ¼ mile of the proposed microturbine. St. Cornelius Elementary is located within 1000 feet and Family Christian Academy is located within ¼ mile of the turbine.

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CRITERIA-POLLUTANT EMISSION SUMMARY**Annual Average Project Emissions Increase:**

Pollutant	lb/day	ton/yr
POC	1.4	0.263
NO _x	0.7	0.131
SO ₂	0.05	0.009
CO	8.64	1.577
PM ₁₀	0.24	0.044
NPOC	0	0

Daily Maximum Emissions by Source (lb/day):

Source	POC	NO _x	SO ₂	CO	PM ₁₀	NPOC
S-1 Microturbine	1.4	0.72	0.05	8.6	0.24	0

EMISSION CALCULATIONS**S-1 Microturbine**

Emission Factor Derivations:

Nitrogen Oxides (NO_x)

Per Air Resources Board Executive Order DG-002, the Capstone C60 MicroTurbine has been certified to meet a nitrogen oxides emission standard of 0.5 pounds per MW-hr. Based upon the maximum rated net output of 60 KW, the corresponding mass emission rate is calculated as follows.

$$\begin{aligned} \text{NO}_x &= (0.5 \text{ lb POC/MW-hr})(60 \text{ KW}) \\ &= 0.03 \text{ lb/hr} \end{aligned}$$

Carbon Monoxide (CO)

Per Air Resources Board Executive Order DG-002, the Capstone C60 MicroTurbine has been certified to meet a carbon monoxide emission standard of 6.0 pounds per MW-hr. Based upon the maximum rated net output of 60 KW, the corresponding mass emission rate is calculated as follows.

$$\begin{aligned} \text{CO} &= (6.0 \text{ lb POC/MW-hr})(60 \text{ KW}) \\ &= 0.36 \text{ lb/hr} \end{aligned}$$

Sulfur Dioxide (SO₂)

The SO₂ emission factor is based upon the PG&E natural gas specifications, which give a maximum sulfur content of 1 gr/100 scf of natural gas.

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$$\begin{aligned} \text{SO}_2 &= (804,000 \text{ BTU/hr})(1 \text{ scf}/1020 \text{ BTU})(1 \text{ gr S}/100 \text{ scf})(\text{lb}/7000 \text{ gr})(2 \text{ g SO}_2/1 \text{ g S}) \\ &= 0.002 \text{ lb/hr} \end{aligned}$$

Precursor Organic Compounds (POC)

Per Air Resources Board Executive Order DG-002, the Capstone C60 MicroTurbine has been certified to meet a volatile organic compound emission standard of 1.0 pound per MW-hr. Based upon the maximum rated net output of 60 KW, the corresponding mass emission rate is calculated as follows.

$$\begin{aligned} \text{POC} &= (1.0 \text{ lb POC}/\text{MW-hr})(60 \text{ KW}) \\ &= 0.06 \text{ lb/hr} \end{aligned}$$

Particulate Matter with an aerodynamic diameter of less than 10 microns (PM₁₀)

Per Air Resources Board Executive Order DG-002, the Capstone C60 MicroTurbine has been certified to meet a particulate matter emission standard corresponding to a natural gas sulfur content of 1.0 gr/100 scf. Assuming that all of the sulfur in the fuel is converted to ammonium sulfate particulate, the corresponding mass PM₁₀ emission rate is calculated as follows.

$$\begin{aligned} \text{PM}_{10} &= (804,000 \text{ BTU/hr})(1 \text{ scf}/1020 \text{ BTU})(1 \text{ gr S}/100 \text{ scf})(\text{lb}/7000 \text{ gr})(132.1 \text{ g H}_8\text{N}_2\text{O}_4\text{S}/16 \text{ g S}) \\ &= 0.01 \text{ lb/hr} \end{aligned}$$

Annual Emissions:

$$\begin{aligned} \text{NO}_x &= (0.03 \text{ lb/hr})(8760 \text{ hr/yr}) \\ &= 262.8 \text{ lb/yr} \\ &= 0.131 \text{ ton/yr} \end{aligned}$$

$$\begin{aligned} \text{CO} &= (0.36 \text{ lb/hr})(8760 \text{ hr/yr}) \\ &= 3,153.6 \text{ lb/yr} \\ &= 1.577 \text{ ton/yr} \end{aligned}$$

$$\begin{aligned} \text{SO}_2 &= (0.002 \text{ lb/hr})(8,760 \text{ hr/yr}) \\ &= 17.5 \text{ lb/yr} \\ &= 0.009 \text{ ton/yr} \end{aligned}$$

$$\begin{aligned} \text{POC} &= (0.06 \text{ lb/hr})(8,760 \text{ hr/yr}) \\ &= 525.6 \text{ lb/yr} \\ &= 0.263 \text{ ton/yr} \end{aligned}$$

$$\begin{aligned} \text{PM}_{10} &= (0.01 \text{ lb/hr})(8,760 \text{ hr/yr}) \\ &= 87.6 \text{ lb/yr} \\ &= 0.044 \text{ ton/yr} \end{aligned}$$

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Daily Maximum Emissions:

$$\text{NO}_x = (0.03 \text{ lb/hr})(24 \text{ hr/day}) \\ = 0.72 \text{ lb/day}$$

$$\text{CO} = (0.36 \text{ lb/hr})(24 \text{ hr/day}) \\ = 8.6 \text{ lb/day}$$

$$\text{SO}_2 = (0.002 \text{ lb/hr})(24 \text{ hr/day}) \\ = 0.05 \text{ lb/day}$$

$$\text{POC} = (0.06 \text{ lb/hr})(24 \text{ hr/day}) \\ = 1.4 \text{ lb/day}$$

$$\text{PM}_{10} = (0.01 \text{ lb/hr})(24 \text{ hr/day}) \\ = 0.24 \text{ lb/day}$$

Toxic Air Contaminant Emissions:

The following emission rates are based upon 24 hr/day, 365 day/year turbine operation at the maximum firing rate of 804,000 BTU/hour.

Compound	Emission Factor¹ (lb/MM BTU)	Annual Emission Rate (lb/yr-turbine)
1,3-butadiene	4.30E-07	0.003
acetaldehyde	4.00E-05	0.282
acrolein	6.40E-06	0.045
benzene	1.20E-05	0.085
ethylbenzene	3.20E-05	0.225
formaldehyde	7.10E-04	5.001
naphthalene	1.30E-06	0.009
PAHs	2.20E-06	0.015
propylene oxide	2.90E-05	0.204
toluene	1.30E-04	0.916

¹AP-42, Table 3.1-3, "Emission Factors for Hazardous Air Pollutants from Natural Gas-Fired Stationary Gas Turbines", 4/00

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FACILITY CUMULATIVE INCREASE

(since April 5, 1991)

	Current		Increase		New Total	
	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr
POC	0	0	1.4	0.263	1.4	0.263
NO_x	0	0	0.7	0.131	0.7	0.131
SO₂	0	0	0.05	0.009	0.05	0.009
CO	0	0	8.64	1.577	8.64	1.577
NPOC	0	0	0	0	0	0
PM₁₀	0	0	0.24	0.044	0.24	0.044

TOXIC RISK SCREENING ANALYSIS

Compound	Project Annual Emission Rate¹ (lb/yr)	Risk Screening Trigger Level (lb/yr)
1,3-butadiene	0.003	1.1
acetaldehyde	0.282	72
acrolein	0.045	3.9
benzene	0.085	6.7
ethylbenzene	0.225	n/s ²
formaldehyde	5.001	33
naphthalene	0.009	270
PAHs	0.015	0.044
propylene oxide	0.204	52
toluene	0.916	39,000

¹based upon worst-case annual firing rate of (24 hr/day)(365 day/yr)(804,000 BTU/hr) = 7043 MM BTU/yr

²none specified

Pursuant to the District Risk Management Policy, no further health risk assessment is required since none of the toxic air contaminants listed above are emitted at rates in excess of their respective risk screening trigger levels.

BACT ANALYSIS

Based upon 24-hr per day operation at the maximum firing rate, the proposed S-1 and S-2 Capstone Microturbines each do not have the potential to emit 10 pounds or more per highest day of precursor organic compounds (POC), non-precursor organic compounds (NPOC), nitrogen oxides (NO_x), sulfur dioxide (SO₂), PM₁₀ or carbon monoxide (CO). Therefore, the BACT requirement of NSR (Regulation 2-2-301.1) does not apply.

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OFFSET ANALYSIS

Because the facility POC and NOx emissions (including proposed S-1 emission increases) will each not exceed 15 tons per year, the offset provision of NSR for those pollutants (Regulation 2-2-302) does not apply. According to the District data bank emission inventory, the current facility POC and NOx emissions from permitted sources are zero since there are no existing permitted sources at the Gunderson High School site.

Because the Gunderson High School facility is not a major facility for SO₂ or PM₁₀, the offset provision of NSR for those pollutants (Regulation 2-2-303) does not apply. A major facility is defined as having the potential to emit greater than 100 tons per year of NOx, POC, SO₂, or CO.

FEE SUMMARY

Source	Fee Schedule	Filing Fee	Initial Fee	Public Notice Fee	Permit to Operate Fee	Source Sub-Total
S-1 MicroTurbine	B	\$250.00	\$176.00	\$900.00	\$126.00	\$1,452.00
Grand Total						\$1,452.00
Amount Paid						\$1,452.00
Log Number						J409E

STATEMENT OF COMPLIANCE

The S-1 Capstone MicroTurbine is not subject to the requirements of Regulation 9, Rule 9 ("NOx From Stationary Gas Turbines") because they it has a power output rating of less than 0.3 MW. This device is not subject to any other District prohibitory rule.

This project is **categorically exempt** from District CEQA Regulation 2-1-311 pursuant to Regulation 2-1-312.11 (Permit applications for a new/modified source(s) or for process changes which will satisfy the "No Net Emission Increase" provisions of Regulation 2, Rule 2, and for which there is no possibility that the project may have any significant environmental effect in connection with any environmental media or resources other than air quality) and therefore is not subject to CEQA review.

The proposed S-1 Turbine will be located within 1000 feet of the outer boundary of a K-12 school and is therefore subject to the public notification requirements of Regulation 2-1-412. Pursuant to Regulation 2-1-412, a public notice describing the proposed micro-turbines will be prepared and distributed to the parents or guardians of children enrolled at St. Cornelius Elementary and Family Christian Academy.

A Toxics Risk Screening Analysis is not required due to the emission of the toxic air contaminants at the rates listed above. TBACT does not apply to this project.

BACT, Offsets, PSD, NSPS, and NESHAPS do not apply to this project.

PERMIT CONDITIONS: None

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RECOMMENDATION

Issue an **Authority to Construct** for the following sources:

S-1 Capstone C60 MicroTurbine #1, natural gas fired; 60 KW, 804,000 BTU per hour (HHV)

Air Quality Engineer II

Date