ENGINEERING EVALUATION
Plant # 19688
Application # 26748
1200 California Corp
1200 California St
San Francisco, CA 94109

BACKGROUND

1200 California Corp has applied for an Authority to Construct to upgrade the following:

S-2 Cogeneration System: Natural Gas Engine, Tecogen, unabated; 60 kW

to:

S-2 Cogeneration System: Natural Gas Engine, Make General Motors, Model TecoDrive 7400, Rated 145 BHP (100kW); Abated by A-1, Non-Selective Catalytic Reduction Catalyst, Tecogen 2-Stage Catalyst System

S-2 is an existing unpermitted 60 kW cogeneration system that was installed in 1994. Its exhaust is located at the roof the 24-story residential high rise building.

Since S-2 is rated at less than 250 bhp, it was an exempt source. It is a loss-of-exemption (LOE) engine since the exemption has been removed years ago. The current project will upgrade the cogeneration system from 60 kW to 100 kW, and will equip it with a non-selective catalytic reduction (NSCR) catalyst to reduce exhaust emissions of nitrogen oxides (NOx), precursor organic compound (POC) and carbon monoxide (CO). This will allow S-2 to meet Regulation 9-8's emission limits. Even without a power upgrade, the existing 60kW engine would need to be abated to meet the Regulation 9-8 limit.

This site is also within 1000 feet of one K-12, thus, this permit review will therefore necessitate a Public Notice.

EMISSION SUMMARY

The existing engine would have been required to be abated to meet Regulation 9-8's 25 ppmv NOx emission limit. Assume a similar NSCR used for the power upgrade project is used as the abatement device for emission calculation. The cogeneration runs 8760 hr/year. The calculated rating is 87 break-horsepower (BPH), and the maximum firing rate of 0.76 MMBtu/hr. For this report, it is assumed that the emission value of Non-Methane Hydrocarbons (NMHC) is equivalent to the emission value of POC. Emission factors from manufacturer's specification are shown below. The emission factors for PM10 and SO2 are from Chapter-3, Table 3.2-3 of the EPA Document AP-42, Emission Factors for 4-Stroke Rich-Burn Engines.

Emission from LOE engine, if retrofitted at existing 60 kW output

Pollutant	basis	g/bhp-hr	lb/mol	ppmv @ 15% O2	lb /mmbtu	lb/hr	lb/day	tpy
NOx	Manuf. Spec	0.36	46	25		0.069	1.656	0.302
CO	Manuf. Spec	1.25	28	143		0.240	5.749	1.049
POC	Manuf. Spec	0.15				0.029	0.690	0.126
PM10	AP42 T3.2-3				0.0095	0.007	0.173	0.032
SO2	AP42 T3.2-3				0.00059	0.000	0.011	0.002

This would be S-2's emission if it had been permitted as a LOE engine and retrofitted to meet Regulation 9-8's NOx emission limit of 25 ppmv.

However, the applicant is also applying to increase S-2's power output from 60 to 100 kW, or 145 bhp and 1.263 MMBtu/hr:

Emission from retrofitted engine upgraded to 100 kW output

Pollutant	basis	g/bhp-hr	lb/mol	ppmv @ 15% O2	lb /mmbtu	lb/hr	lb/day	tpy
NOx	Manuf. Spec	0.36	46	25		0.115	2.759	0.504
CO	Manuf. Spec	1.25	28	143		0.399	9.581	1.749
POC	Manuf. Spec	0.15				0.048	1.150	0.210
PM10	AP42 T3.2-3				0.0095	0.012	0.288	0.053
SO2	AP42 T3.2-3				0.00059	0.001	0.018	0.003

For NOx and CO, the ppmv @ 15% O2 will be used as limits in S-2's permit condition.

The emission increase from the power increase is:

Pollutant	emission increase lb/day	emission increase tpy
NOx	1.104	0.201
CO	3.833	0.699
POC	0.460	0.084
PM10	0.115	0.021
SO2	0.007	0.001

Plant Cumulative Increase: (ton/year):

Pollutant	Increase tpy
NOx	0.201
CO	0.699
POC	0.084
PM10	0.021
SO2	0.001

TOXICS RISK SCREENING

Emission factors for Toxic Air Contaminants (TACs) are from the California Air Toxics Emission Factor Database (maintained by the California Air Resources Board) for Natural Gas Fired 4-Stroke Rich Burn Engines with less than 650 hp. The detailed TAC emission calculations are shown in below. None of the TAC emissions exceed their District Risk Screening Trigger levels, so a health risk screening analysis (HRSA) is not necessary.

Toxic Air Contaminant	PEF for PAHs	CATEF Factors Mean*	Assumed Abatement Factor	Yearly Emission	Chronic Trigger	Trigger Chronic?	Hourly Emission	Acute Trigger	Trigger Acute?
		(lb/MMcf)	%	(lb/year)	(lb/year)	(Yes/No)	(lb/hr)	(lb/hr)	(Yes/No)
1,3-Butadiene		1.04E-01	50.0	5.64E-01	6.30E-01	No			
Acetaldehyde		8.83E-01	50.0	4.79E+00	3.80E+01	No	5.47E-04	1.00E+00	No
Acrolein		5.47E-01	50.0	2.97E+00	1.40E+01	No	3.39E-04	5.50E-03	No
Benzene		7.39E-02	0.0	8.01E-01	3.80E+00	No	9.15E-05	2.90E+00	No
Ethylbenzene		1.16E-02	50.0	6.29E-02	4.30E+01	No			
Formaldehyde		4.99E-02	0.0	5.41E-01	1.80E+01	No	6.18E-05	1.20E-01	No
Naphthalene		7.65E-02	50.0	4.15E-01	3.20E+00	No			
PAH or derivative									
Benzo(a)anthracene	0.1	2.94E-04							
Benzo(a)pyrene	1	1.15E-04							
Benzo(b)fluoranthene	0.1	2.37E-04							
Benzo(k)fluoranthene	0.1	1.03E-04							
Chrysene	0.01	3.10E-04							
Dibenz(a,h)anthracene	1.05	1.25E-05							
Indeno(1,2,3-cd)pyrene	0.1	1.69E-04							
PAH or derivative TOTAL		2.12E-04	50.0	1.15E-03	6.90E-03	No			
Propylene		1.60E+01	50.0	8.68E+01	1.20E+05	No			
Toluene		1.07E+00	50.0	5.80E+00	1.20E+04	No	6.62E-04	5.50E-03	No
Xylene		6.02E-02	50.0	3.26E-01	2.70E+04	No	3.73E-05	2.90E+00	No

STATEMENT OF COMPLIANCE

Regulation 9, Rule 1:
The owner/operator of S-2 is expected to comply with Reg. 9-1-301 (Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations) because all it burns pipeline quality natural gas which has low sulfur content. From Regulation 9-1-301, the ground level concentrations of SO_2 will not exceed 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours.

Regulation 6, Rule 1:
Since the engine S-2 is fueled with natural gas, the owner/operator is expected to comply with Regulation 6 (Particulate Matter General Requirements). Thus for any period aggregating more than three minutes in any hour, there should be no visible emission as dark or darker than No. 1 on the Ringelmann Chart (Regulation 6-1-301) and no visible emission to exceed 20% opacity (Regulation 6-1-302).

Regulation 9, Rule 8:
The owner/operator shall comply with Reg. 9-8-301 (Emission Limits for Spark-Ignited Engines Powered by Fossil Derived Fuels). NOx and CO emissions shall not exceed 25 ppm and 2000 ppm as corrected to 15% O_2, respectively. Based on the emission summary, S-2 meets the NOx and CO standards.

The project is considered to be ministerial under the District's CEQA regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emissions factors and therefore is not discretionary as defined by CEQA. (Permit Handbook Chapter 2.3)

The project is over 1000 feet from the nearest school and therefore not subject to the public notification requirements of Reg. 2-1-412.

Best Available Control Technology:
In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NOx, CO, SO_2 or PM_{10}.

Based on daily (24 hours) emission calculations above, the owner/operator of S-2 is not subject to BACT for any pollutants.

Offsets:
Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NOx. Based on the above emission calculations and the plant's current emission, offsets are not required for this application.

PSD does not apply.

New Source Performance Standards:
S-2 is subject to 40 CFR part 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, because the owner/operator commenced operation after June 12, 2006 and the engine has a maximum engine power less than 500 hp per Section 60.4230(a)(4)((iii).

Section 60.4233(d) requires compliance with the field testing requirements of 40 CFR 1048.101(c) for engines that are non-emergency SI natural gas greater than or equal to 25 and less than 100 horsepower.

The field testing standards are:

HC + NOx	2.8 g/HP-hr
CO	4.8 g/HP-hr

Section 60.4243 states that the owner/operator must comply by purchasing an engine that is certified to meet the standard and by operating and maintaining the engine according to the manufacturer's instructions. In this case, the owner/operator is not subject to performance testing. The engine meets the standards as purchased.

In addition, the owner/operator must comply with the applicable sections of 40 CFR 1068, subparts A through D. Generally, for owner/operators, this standard prohibits tampering with the emission controls.

National Emission Standard for Hazardous Air Pollutants:
Engines with less than 500 HP built after June 12, 2006, and subject to NSPS 40 CFR Part 60 Subpart JJJJ are exempt from NESHAPS per section 40 CFR 63.6590.

Public Notification:
The Cathedral School for Boys is located within 1000 feet from this facility. No other school is located within ¼ mile. The Cathedral School for Boys is therefore subject to the public notification requirements of Regulation 2-1-412 due to the increase in the emissions from this project.

A public notice will be sent to all parents of students of the above-mentioned school(s) and all residents within 1000 feet of the facility. There will be a 30-day public comment period.

PERMIT CONDITIONS

S-2, Natural Gas Fired Cogeneration Engine, is subject to Permit Conditions No. 25939:

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1. The owner/operator shall fire natural gas
   exclusively at S-2, Natural Gas Cogeneration
   System.
   [Basis: Cumulative Increase]

2. The owner/operator shall not operate S-2,
   unless emissions from S-2 is abated by the
   properly maintained A-1, Non-Selective
   Catalytic Reduction Catalyst System.
  [Basis: Cumulative Increase]

3. The owner/operator shall ensure that emissions
   from S-2 meet all of the following limits:
   (a) NOx: 0.36 g/bhp-hr or 25 ppmv at 15% oxygen
       dry basis;
   (b) CO: 1.25 g/bhp-hr or 143 ppmv at 15% oxygen
       dry basis.
   [Basis: Cumulative Increase]
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4. The owner/operator shall monitor the NOx and CO emissions at S-2 at least once during each calendar quarter, in which a source test is not performed, using a portable analyzer in according to the District Regulation 9-8-503. [Basis: Cumulative Increase; Regulation 9-8-503]

5. The Owner/Operator shall maintain the following records in a District-approved log for at least 24 months from the date of entry. Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.
   (a) Each calendar quarter monitoring results for NOx and CO emissions to demonstrate compliance with emission limits.
   (b) Fuel usage for engine.
   (c) Records of maintenance conducted
   [Basis: Recordkeeping]

RECOMMENDATION

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state, and federal air quality related regulations. The preliminary recommendation is to issue and Authority to Construct for the equipment listed below. However, the proposed source will be located within 1,000 feet of at least one school, which triggers the public notification requirements of Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct for the following equipment:

S-2 Cogeneration System: Natural Gas Engine, Make General Motors, Model TecoDrive 7400, Rated 145 BHP; Abated by A-1, Non-Selective Catalytic Reduction Catalyst, Tecogen 2-Stage Catalyst System

By:_____ Date:_____
Eric Chan
Air Quality Engineer