

DRAFT
Engineering Evaluation
Santa Rosa Junior College
Application # 25029
Plant # 15870

BACKGROUND

Stowell Distributed Power Corporation and Santa Rosa Junior College (SDP-SRJC, LLC) has applied for an Authority to Construct/Permit to Operate for the following:

S-10 Cogeneration System: Natural Gas Engine, Make CA Components, Model CAC/V12/2010/12, Model Year 2012, Rated 354 BHP; Abated by A-10, Non-Selective Catalytic Reduction Catalyst, Make ECS, Model Envicat 3760.

S-11 Cogeneration System: Natural Gas Engine, Make Daewoo, Model GE08TIC, Model Year 2004, Rated 108 BHP; Abated by A-11, Non-Selective Catalytic Reduction Catalyst, Make ECS, Model Envicat 3760.

Stowell Distributed Power Corporation and Santa Rosa Junior College will jointly operate the new engines, which will be located in the Santa Rosa Junior College campus. The engines will be used as primary electrical generation and the cogeneration for excess heat will be used at the facility. The cogen systems will each be equipped with a non-selective catalytic reduction (NSCR) system for emission control. They are intended to replace two existing diesel generators.

EMISSIONS CALCULATIONS

Basis:

Each cogeneration system is assumed to be operated 24 hours/day and 8760 hours/year since no limits are imposed on the operations. For this report, it is assumed that the emission value of Non-Methane Hydrocarbons (NMHC) or Volatile Organic Compounds (VOC) is equivalent to the emission value of Precursor Organic Compounds (POC). Emission factors and their respective basis are summarized below:

Component	Emission Factor	Unit	Basis
S-10:			
NOx	25	ppmv at 15% O2	District Regulation 9-8-301.1
CO	56	ppmv at 15% O2	BACT2
POC	2.96E-2	lb/MMBtu	Table 3.2-3 of EPA AP-42
PM10	1.94E-2	lb/MMBtu	Table 3.2-3 of EPA AP-42
SO2	5.88E-4	lb/MMBtu	Table 3.2-3 of EPA AP-42
S-11:			
NOx	25	ppmv at 15% O2	District Regulation 9-8-301.1
CO	99	ppmv at 15% O2	Manufacturer Specifications
POC	2.96E-2	lb/MMBtu	Table 3.2-3 of EPA AP-42
PM10	1.94E-2	lb/MMBtu	Table 3.2-3 of EPA AP-42
SO2	5.88E-4	lb/MMBtu	Table 3.2-3 of EPA AP-42

The emission factors for NOx and CO can be converted to lb/MMBtu as shown below:

$$\text{lb NOx/MMBtu} = (25 \text{ ppmv}) (21-0)/(21-15) [(46 \text{ lb-mol/lb}) (8710 \text{ dscf/MMBtu}) (\text{lb/mol}/359 \text{ dscf})] \\ = 0.097 \text{ lb/MMBtu}$$

$$\text{lb CO/MMBtu for S-10} = (56 \text{ ppmv}) (21-0)/(21-15) [(28 \text{ lb-mol/lb}) (8710 \text{ dscf/MMBtu}) \\ (\text{lb/mol}/359 \text{ dscf})] \\ = 0.132 \text{ lb/MMBtu}$$

$$\text{lb CO/MMBtu for S-11} = (99 \text{ ppmv}) (21-0)/(21-15) [(28 \text{ lb-mol/lb}) (8710 \text{ dscf/MMBtu}) \\ (\text{lb/mol}/359 \text{ dscf})] \\ = 0.236 \text{ lb/MMBtu}$$

Annual Emissions:

S-10:

NOx	=	(	0.097	lb/MMBtu)	(	3.30	MMBtu/hr)	(	8760	hr/yr)	=	2804.08	lb/yr	=	1.402	TPY
CO	=	(	0.132	lb/MMBtu)	(	3.30	MMBtu/hr)	(	8760	hr/yr)	=	3815.86	lb/yr	=	1.908	TPY
POC	=	(	0.030	lb/MMBtu)	(	3.30	MMBtu/hr)	(	8760	hr/yr)	=	855.68	lb/yr	=	0.428	TPY
PM ₁₀	=	(	0.019	lb/MMBtu)	(	3.30	MMBtu/hr)	(	8760	hr/yr)	=	561.10	lb/yr	=	0.281	TPY
SO ₂	=	(	0.0006	lb/MMBtu)	(	3.30	MMBtu/hr)	(	8760	hr/yr)	=	17.00	lb/yr	=	0.008	TPY

S-11:

NOx	=	(	0.097	lb/MMBtu)	(	1.01	MMBtu/hr)	(	8760	hr/yr)	=	858.22	lb/yr	=	0.429	TPY
CO	=	(	0.236	lb/MMBtu)	(	1.01	MMBtu/hr)	(	8760	hr/yr)	=	2088.03	lb/yr	=	1.044	TPY
POC	=	(	0.030	lb/MMBtu)	(	1.01	MMBtu/hr)	(	8760	hr/yr)	=	261.89	lb/yr	=	0.131	TPY
PM ₁₀	=	(	0.019	lb/MMBtu)	(	1.01	MMBtu/hr)	(	8760	hr/yr)	=	171.73	lb/yr	=	0.086	TPY
SO ₂	=	(	0.0006	lb/MMBtu)	(	1.01	MMBtu/hr)	(	8760	hr/yr)	=	5.20	lb/yr	=	0.003	TPY

Maximum Daily Emissions:

S-10:

NOx	=	(	0.097	lb/MMBtu)	(	3.30	MMBtu/hr)	(	24	hr/day)	=	7.68	lb/day
CO	=	(	0.132	lb/MMBtu)	(	3.30	MMBtu/hr)	(	24	hr/day)	=	10.45	lb/day
POC	=	(	0.030	lb/MMBtu)	(	3.30	MMBtu/hr)	(	24	hr/day)	=	2.34	lb/day
PM ₁₀	=	(	0.019	lb/MMBtu)	(	3.30	MMBtu/hr)	(	24	hr/day)	=	1.54	lb/day
SO ₂	=	(	0.0006	lb/MMBtu)	(	3.30	MMBtu/hr)	(	24	hr/day)	=	0.05	lb/day

S-11:

NOx	=	(	0.097	lb/MMBtu)	(	1.01	MMBtu/hr)	(	24	hr/day)	=	2.35	lb/day
CO	=	(	0.236	lb/MMBtu)	(	1.01	MMBtu/hr)	(	24	hr/day)	=	5.72	lb/day
POC	=	(	0.030	lb/MMBtu)	(	1.01	MMBtu/hr)	(	24	hr/day)	=	0.72	lb/day
PM ₁₀	=	(	0.019	lb/MMBtu)	(	1.01	MMBtu/hr)	(	24	hr/day)	=	0.47	lb/day
SO ₂	=	(	0.0006	lb/MMBtu)	(	1.01	MMBtu/hr)	(	24	hr/day)	=	0.01	lb/day

Plant Cumulative Increase: (ton/year):

Pollutant	Current	Application Increase	New Total
NO _x	0.779	1.831	2.610
CO	2.319	2.952	5.271
POC	0.771	0.559	1.330
PM ₁₀	0.005	0.367	0.372
SO ₂	0.000	0.011	0.011

TOXICS RISK SCREENING ANALYSIS

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 Appendix A. The toxic emissions of Butadiene from the cogeneration systems with NSCR exceed the District Risk Screening Chronic Trigger level, so a health risk screening analysis (HRSA) has been performed.

The results of the HRSA indicate that the maximum project cancer risk is 0.4 in a million, the chronic hazard index is 0.1, and the acute hazard index is 0.02. In accordance with the District's Regulation 2-5, these risk levels are in compliance with the requirements in Section 301 and 302.

STATEMENT OF COMPLIANCE

Regulation 9, Rule 1:

The owner/operator of S-10 and S-11 is expected to comply with Reg. 9-1-301 (Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations) because both engines burn pipeline quality natural gas which has low sulfur content. From Regulation 9-1-301, the ground level concentrations of SO₂ 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 engines are fueled with natural gas, the owner/operator is expected to comply with Regulation 6-1 (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). NO_x and CO emissions shall not exceed 25 ppm and 2000 ppm as corrected to 15% O₂ respectively. Based on the emissions calculations above, both engines meet the NO_x 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 2.3.2)

Public Notification:

The project is within 1000 feet from the nearest school and therefore is subject to the public notification requirements of Reg. 2-1-412. Notifications will be distributed to parents or guardians of children enrolled at Santa Rosa High School and Ridgway High School, and all residential and business neighbors within 1,000 feet of the proposed new sources.

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, SO₂ or PM₁₀.

Based on daily emission calculations above, the owner/operator of S-10 is subject to BACT for CO. The District's BACT requirements for "IC Engine – Spark Ignition, Natural Gas Fired Rich Burn Engine >= 50 HP" are addressed in the BACT Guideline, document # 96.3.2, revision 1, dated May 7, 2003. The BACT2 requirement for CO is 0.60 g/bhp-hr (56 ppmvd @ 15% O₂) and the typical technology is a 3-way catalyst. CO emissions from S-10 are abated by a 3-way catalyst, and therefore, is expected to meet the BACT2 requirement for CO. An initial source test requirement will be specified as a permit condition to demonstrate compliance with the BACT level.

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 emissions calculations above, offsets are not required for this application.

Prevention of Significant Deterioration:

The emission increase resulting from this project is expected to be less than 3 TPY for each criteria pollutant. Since it is far below the PSD thresholds, the project is not subject to PSD review.

New Source Performance Standards:

These engines are subject to 40 CFR part 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition (SI) Internal Combustion Engines (ICE), because the owner/operator commenced operation after June 12, 2006 and each engine has a maximum engine power less than 500 hp per §60.4230(a)(4)(iii). Though S-11 is a 2004 model year engine, the engine is still subject to the applicable requirement in §60.4233 because the owner/operator is installing the engine after July 1, 2010 per §60.4236(a).

Section 60.4233(e) requires compliance with the emission standards in Table 1 to this subpart for stationary SI ICE greater than or equal to 100 horsepower.

According to Table 1, S-10 is subject to the following emission standards for non-emergency SI Natural Gas engine manufactured after January 1, 2011 in between 100 to 500 horsepower:

NOx: 1.0 g/HP-hr or 82 ppmvd at 15% O₂
CO: 2.0 g/HP-hr or 270 ppmvd at 15% O₂
VOC: 0.7 g/HP-hr or 60 ppmvd at 15% O₂

According to Table 1, S-11 is subject to the following emission standards for non-emergency SI Natural Gas engine manufactured after July 1, 2008 in between 100 to 500 horsepower:

NOx: 2.0 g/HP-hr or 160 ppmvd at 15% O₂
CO: 4.0 g/HP-hr or 540 ppmvd at 15% O₂
VOC: 1.0 g/HP-hr or 86 ppmvd at 15% O₂

For engines in between 25 to 500 HP, section 60.4243(b) states that the owner/operator must comply with the emission standards specified in §60.4233(d) or (e) by either purchasing a certified engine or by performing all of the following for a non-certified engine:

- Demonstrating compliance with the emission standards according to the requirements specified in 60.4244;
- Keeping a maintenance plan and records of conducted maintenance to minimize emissions;
- Performing an initial performance test.

Since neither engine is certified, an initial performance test will be required to demonstrate compliance and will be specified as a permit condition for both sources.

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:

Because the engines are subject to 40 CFR Part 60 and are new stationary RICE at an area source, the owner/operator must meet the requirements of 40 CFR part 63 Subpart ZZZZ by meeting the requirements of 40 CFR 60 Subpart JJJJ per §63.6590(c)(1).

PERMIT CONDITIONS

S-10 and S-11 will be subject to the permit conditions as shown below:

1. The owner/operator shall fire natural gas exclusively at each engine. [Basis: Cumulative Increase]
2. The owner/operator shall not operate S-10, Natural Gas Cogeneration System, unless emissions from S-10 are abated by the properly maintained A-10, Non-Selective Catalytic Reduction Catalyst. [Basis: Cumulative Increase]
3. The owner/operator shall not operate S-11, Natural Gas Cogeneration System, unless emissions from S-11 are abated by the properly maintained A-11, Non-Selective Catalytic Reduction Catalyst. [Basis: Cumulative Increase]
4. The owner/operator shall ensure that emissions from S-10 meet all of the following limits:
 - (a) NOx: 0.43 g/bhp-hr or 25 ppmv at 15% oxygen dry basis [Basis: Cumulative Increase];
 - (b) CO: 0.60 g/bhp-hr or 56 ppmv at 15% oxygen dry basis [Basis: BACT].
5. The owner/operator shall ensure that emissions from S-11 meet all of the following limits:
 - (a) NOx: 0.43 g/bhp-hr or 25 ppmv at 15% oxygen dry basis [Basis: Cumulative Increase];
 - (b) CO: 1.0 g/bhp-hr or 99 ppmv at 15% oxygen dry basis [Basis: Cumulative Increase].
6. The owner/operator shall monitor the NOx and CO emissions at each engine at least once during each calendar quarter, in which a source test is not performed, using a portable analyzer in accordance to the District Regulation 9-8-503. [Basis: BACT; Cumulative Increase; Regulation 9-8-503]
7. The owner/operator shall conduct a district-approved source test within 60 days of startup of S-10 and S-11 to verify compliance with Parts 4 and 5, all applicable NOx and CO standards in

BAAQMD Regulation 9 Rule 8, all applicable NOx, CO and VOC standards in 40 CFR 60 Subpart JJJJ. The owner/operator shall submit a source test protocol to the District at least 30 days prior to the testing date, and shall notify the District of the testing date at least ten days prior to the test so that a District observer may witness the test. The source test protocol shall comply with the test methods for NOx, CO, and stack gas oxygen content set forth in Regulation 9-8-600 and the requirements specified in 40 CFR 60.4244. Alternative test methods, and source testing scope, may also be used to address the source testing requirements of the permit if approved in advance by the District. The source test reports shall be provided to the District within 30 days of the testing date. [Basis: Regulation 2-1-403; 40 CFR 60.4243(b)(2)(i)]

8. 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

(d) Source test reports

[Basis: Recordkeeping]

RECOMMENDATIONS

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 Authorities to Construct for the equipment listed below. However, the proposed source will be located within 1000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412.6. 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 Authorities to Construct for the following source:

S-10 Cogeneration System: Natural Gas Engine, Make CA Components, Model CAC/V12/2010/12, Model Year 2012, Rated 354 BHP; Abated by A-10, Non-Selective Catalytic Reduction Catalyst, Make ECS, Model Envicat 3760.

S-11 Cogeneration System: Natural Gas Engine, Make Daewoo, Model GE08TIC, Model Year 2004, Rated 108 BHP; Abated by A-11, Non-Selective Catalytic Reduction Catalyst, Make ECS, Model Envicat 3760.

By: _____ Date: _____

Xuna Cai
Air Quality Engineer

Appendix A

**For 4-Stroke Rich Burn Engine <650 HP
Application 25029 (Two Natural Gas Engines):**

Max. Fuel Rate (MMcf/hr)=	4.23E-03
# of Hours/Yr Operation =	8760

Toxic Air Contaminant	PEF for PAHs	CATEF Factors Mean* (lb/MMcf)	Assumed Abatement Factor %	Abated Emissions (lb/year)	Trigger Level (lb/year)	Trigger? (Yes/No)	Emissions (lb/hr)	Trigger Level (lb/hr)	Trigger? (Yes/No)
1,3-Butadiene		1.04E-01	50.0	1.92E+00	6.30E-01	Yes		N/A	
Acetaldehyde		8.83E-01	50.0	1.63E+01	3.80E+01	No	1.87E-03	1.00E+00	
Acrolein		5.47E-01	50.0	1.01E+01	1.40E+01	No	1.16E-03	5.50E-03	No
Benzene		7.39E-02	0.0	2.74E+00	3.80E+00	No	3.12E-04	2.90E+00	No
Ethylbenzene		1.16E-02	50.0	2.15E-01	4.30E+01	No		N/A	
Formaldehyde		4.99E-02	0.0	1.85E+00	1.80E+01	No	2.11E-04	1.20E-01	No
Naphthalene		7.65E-02	50.0	1.42E+00	3.20E+00	No		N/A	
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	3.91E-03	6.90E-03	No		N/A	
Propylene		1.60E+01	50.0	2.96E+02	1.20E+05			N/A	
Toluene		1.07E+00	50.0	1.98E+01	1.20E+04	No	2.26E-03	8.20E+01	No
Xylene		6.02E-02	50.0	1.11E+00	2.70E+04	No	1.27E-04	4.90E+01	No

*Note: Benzene and Formaldehyde emissions are from the CATEF database for 4 Stroke Rich Burn IC Engines <650 HP using NSCR. A catalyst abatement factor of 50% was applied to all other TACs.