

Draft Engineering Evaluation
Pacific Gas and Electric Company
Plant No. 3172
Application No. 682739
450 Eastmoor Avenue, Daly City, CA 94105

BACKGROUND

Pacific Gas and Electric Company is applying for an Authority to Construct and Permit to Operate an Emergency Standby Generator Set, fueled by Natural Gas (NG).

S-11 Emergency Standby Natural Gas Engine Generator Set: Engine, Make Kohler (EPA Family: NKHXB06.2HNL, Model KG6208THD, Model Year 2022, Rated 204 BHP.

S-11 will be located at 450 Eastmoor Avenue in Daly City, CA. The primary pollutants from NG engines are the products of combustion, including nitrogen oxides (NO_x), carbon monoxide (CO), hydrocarbon and other organic compounds (precursor organic compounds, POCs), sulfur dioxide (SO₂), and particulate matter (PM₁₀ and PM_{2.5}). Various toxic air contaminants (TACs) are also emitted during the combustion of NG.

The project is located within 1000 ft of a school and is therefore subject to the public notice requirements of BAAQMD Regulation 2-1-412.

EMISSION CALCULATIONS

Basis:

- Maximum output rating of 204 HP, per EPA certification rating data.
- Maximum operational duration: 50 hours per year for non-emergency purposes, up to 24 hours per day
- Maximum fuel usage rate of 1678 cubic feet per hour
(equivalent to 1.75 MMBtu/hr, assuming NG heat content = 1,040 Btu/SCF)

Annual Emissions and Daily Maximum Emissions:

The EPA Certification Emission Rates for NO_x, CO, and POC emissions from the engine were used for the emission calculations.

EPA Certification Emission Rates (unabated)

NO_x = 0.010 g/kW-hr (0.007 g/bhp-hr)

CO = 0.350 g/kW-hr (0.261 g/bhp-hr)

POC = 0.170 g/kW-hr (0.127 g/bhp-hr)

The particulate matter (PM) and SO₂ emissions were calculated using emission factors from EPA's AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (Uncontrolled Emission Factors For 4-Stroke Rich-Burn Engines). The total PM emission factor consists of the sum of filterable plus condensable emission factors in AP-42. The SO₂ emission factor in AP-42 was multiplied by a factor of 5 since the sulfur content of the natural gas used to develop the AP-42 factor is based on 2000 grains/MMSCF (vs. sulfur content in PUC quality natural gas of 1 grain/100 SCF).

The daily maximum emissions were calculated assuming 24-hr/day of operation.

The annual and daily maximum emissions from S-11 are summarized below in Table 1.

Table 1 – Daily and Annual Maximum Emissions for S-11					
Pollutant	E.F.	E.F. Unit	Emissions		
			Daily (lbs/day)	Annual (lbs/yr)	Annual (TPY)
NO _x	7.46E-03	g/bhp-hr	0.080	0.168	0.000
CO	2.61E-01	g/bhp-hr	2.817	5.869	0.003
POC	1.27E-01	g/bhp-hr	1.368	2.851	0.001
PM ₁₀	1.94E-02	lb/MMBtu	0.813	1.694	0.001
PM _{2.5}	1.94E-02	lb/MMBtu	0.813	1.694	0.001
SO ₂	2.94E-03	lb/MMBtu	0.123	0.257	0.000

^a Emission factors for NO_x, CO, and POC per EPA certification.

^b Emission factors for PM₁₀ and SO₂ were retrieved from AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3. PM emission factors consist of filterable plus condensable fractions. The sulfur emission factor is multiplied by a factor of 5 to account for PUC quality natural gas content of 1 grain/100 SCF. These numbers are uncontrolled (unabated) emissions.

Plant Cumulative Increase:

Table 2 summarizes the cumulative increase in criteria pollutant emissions resulting from the operation of S-11. All existing sources at the facility are loss of exemption sources.

Table 2 – Plant Cumulative Emissions			
Pollutant	Emissions (TPY)		
	Existing	New	Total
NO _x	0.000	0.000	0.000
CO	0.000	0.003	0.003
POC	0.000	0.001	0.001
PM ₁₀	0.000	0.001	0.001
PM _{2.5}	0.000	0.001	0.001
SO ₂	0.000	0.000	0.000

TOXIC HEALTH RISK ASSESSMENT

Per BAAQMD Engineering Division Permit Handbook, Chapter 2.3.2 Stationary Natural Gas Engines, toxic emission factors from California Air Toxics Emission Factors (CATEF) are generally preferred over those found in AP-42. TAC emission factors were therefore retrieved from CATEF for Natural Gas-fired Rich Burn Engines rated < 650 hp. The TAC emission estimates are based on uncontrolled emission factors for natural gas engines.

Based on the calculations in Table 3 below, no TACs exceed the District's Risk Screening trigger levels set forth in Table 1 of Reg. 2-5 (New Source Review for Toxic Air Contaminants). Therefore, a Health Risk Assessment (HRA) is not required.

Compound	PEF for PAHs ¹	E.F. ² [lb/MMcf]	Hourly Abated Emissions [lb/hr]	Acute Trigger Level [lb/hr]	HRA Triggered? (Acute)	Annual Abated Emissions [lb/yr]	Chronic Trigger Level [lb/yr]	HRA Triggered? (Chronic)
1,3-Butadiene		1.04E-01	1.75E-04	2.90E-01	No	8.73E-03	4.80E-01	No
Acetaldehyde		8.83E-01	1.48E-03	2.10E-01	No	7.41E-02	2.90E+01	No
Acrolein		5.47E-01	9.18E-04	1.10E-03	No	4.59E-02	1.40E+01	No
Benzene		1.91E+00	3.20E-03	1.20E-02	No	1.60E-01	2.90E+00	No
Ethyl benzene		1.16E-02	1.95E-05	None	No	9.73E-04	3.30E+01	No
Formaldehyde		2.35E+00	3.94E-03	2.40E-02	No	1.97E-01	1.40E+01	No
Naphthalene		7.65E-02	1.28E-04	None	No	6.42E-03	2.40E+00	No
Benzo(a)anthracene	0.1	2.94E-04	4.93E-07	None	No	2.47E-05	None	No
Benzo(a)pyrene	1.0	1.15E-04	1.93E-07	None	No	9.65E-06	None	No
Benzo(b)fluoranthene	0.1	2.37E-04	3.98E-07	None	No	1.99E-05	None	No
Benzo(k)fluoranthene	0.1	1.03E-04	1.73E-07	None	No	8.64E-06	None	No
Chrysene	0.01	3.10E-04	5.20E-07	None	No	2.60E-05	None	No
Dibenz(a,h)anthracene	1.05	1.25E-05	2.10E-08	None	No	1.05E-06	None	No
Indeno(1,2,3-cd)pyrene	0.1	1.69E-04	2.84E-07	None	No	1.42E-05	None	No
PAH or derivative TOTAL		2.12E-04	3.55E-07	None	No	1.77E-05	3.30E-03	No
Propylene		1.60E+01	2.68E-02	None	No	1.34E+00	1.2E+05	No
Toluene		1.07E+00	1.80E-03	2.20E+00	No	8.98E-02	1.20E+04	No
Xylene		6.02E-02	1.01E-04	9.70E+00	No	5.05E-03	2.70E+04	No

¹ These substances are PAH-derivatives that have OEHHA-developed Potency Equivalency Factors (PEFs). PAHs should be evaluated as benzo(a)pyrene-equivalents. This evaluation process consists of multiplying individual PAH-specific emission levels with their corresponding PEFs listed below. The sum of these products is the benzo(a)pyrene-equivalent level and should be compared to the benzo(a)pyrene equivalent trigger level. (Source 2-5, Table 2-5-1, Footnote #8). Note: CATEF Emission Factors for Rich Burn, 4 Stroke, Natural Gas Engines, < 650 HP also lists anthracene, acenaphthylene, acenaphthylene, benzo(g,h,i)perylene, fluoranthene, fluorene, phenanthrene and pyrene. However, Reg 2-5-1 does not list any PAH derivative PEFs listed. Therefore, these are not included in calculating the PAH E.F. (see E.F. calculation backup, table below):

Compound	PEF for PAHs	E.F. [lb/MMcf]	E.F. × PEF
Benzo(a)anthracene	0.1	2.94E-04	2.94E-05
Benzo(a)pyrene	1.0	1.15E-04	1.15E-04
Benzo(b)fluoranthene	0.1	2.37E-04	2.37E-05
Benzo(k)fluoranthene	0.1	1.03E-04	1.03E-05
Chrysene	0.01	3.10E-04	3.10E-06
Dibenz(a,h)anthracene	1.05	1.25E-05	1.31E-05
Indeno(1,2,3-cd)pyrene	0.1	1.69E-04	1.69E-05
		PAH E.F.	2.12E-04

² CATEFs are used when AP-42 EFs are less conservative than CATEFs. Reported mean emission factor values are used in accordance with District procedures.

GRAIN LOADING RATE

The grain loading rate calculation is required for determining the compliance of this application with BAAQMD Regulation 6, Rule 1 (refer to "Statement of Compliance" section, below).

$$[0.0340 \text{ lb PM}_{10}/\text{hr} * 7000 \text{ grain/lb}] / [60 \text{ min/hr} * 309.8 \text{ DSCFM}] = 0.01 \text{ grain/dscf}$$

Assumptions:

- $1.94\text{E-}02 \text{ lb PM}_{10}/\text{MMBtu} * 1.75 \text{ MMBtu/hr} = 0.0340 \text{ lb PM}_{10}/\text{hr}$
- 7000 grain/lb standard conversion factor (AP-42 Appendix A, Page A-19)
- Per applicant, S-11 has maximum flow of 1024 acfm at 1292°F dry exhaust; this is equivalent to 309.8 DSCFM:

$$\text{DSCFM} = \text{ACFM} \times [(460^\circ\text{R} + 70^\circ\text{F}) / (460^\circ\text{R} + \text{temp})] \times (\text{Actual P} / 14.7 \text{ psi}) \times (1 - B_w)$$

Where: ACFM = 1024 cfm, temp = 1292°F, Actual P = 14.7 psi, $B_w = 0$ (fraction of water vapor)

STATEMENT OF COMPLIANCE

The owner/operator of S-11 shall comply with Reg. 6-1 (Particulate Matter and Visible Emissions Standards), Reg. 9-1-301 (Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations), and Reg. 9-8 (Nitrogen Oxides and Carbon Monoxide from Stationary ICE).

The owner/operator is expected to comply with Reg. 6-1 since the unit is fueled with NG. Because the S-11 engine has displacement of 6.2L (378.3 cubic inch), the Ringelmann No. 2 Limitation applies per Section 6-1-303 (ICE engine of less than 25 L or 1500 cubic inch displacement). Thus, for any period aggregating more than three minutes in any hour, there should be no visible emission as dark or darker than No. 2 on the Ringelmann Chart or be equal to or greater than 40% opacity. S-11 is expected to comply with this requirement, as well as the visible particles requirement of Section 6-1-305. The emission rate from S-11 results in an outlet grain loading of 0.01 grains/dscf, which is less than the limit 0.15 grains/dscf and therefore complies with Regulation 6-1-310.1. The TSP limits in 6-1-310.2 (effective as of July 1, 2020) will not apply because the potential to emit TSP is below 1,000 kg per year.

The owner/operator is expected to comply with Regulation 9-1 by restricting fuel to NG only. Combustion of NG is expected to produce a SO₂ concentration of no more than 1 ppmv. Therefore, the source is expected to comply with Section 9-1-301 (Limitations on Ground Level Concentrations) and 9-1-304 (Fuel Burning).

Based on Reg. 9-8-110.5 (Exemptions for Emergency Standby Engines), S-11 is exempt from the requirements of Reg. 9-8-301 (Emission Limits on Fossil Derived Fuel Gas), 9-8-302 (Emission Limits on Waste Derived Fuel Gas), 9-8-303 (Emissions Limits – Delayed Compliance, Existing Spark-Ignited Engines, 51 to 250 bhp or Model Year 1996 or Later), 9-8-304 (Emission Limits – Compression-Ignited Engines), 9-8-305 (Emission Limits – Delayed Compliance, Existing Compression-Ignited Engines, Model Year 1996 or Later), 9-8-501 (Initial Demonstration of Compliance) and 9-8-503 (Quarterly Demonstration of Compliance). However, S-11 is subject to the monitoring and record keeping procedures described in Reg. 9-8-530 (Emergency Standby Engines, Monitoring and Recordkeeping). The requirements of this Regulation are included in the permit conditions below.

S-11 is also subject to and expected to comply with Regulation 9-8-330 (Emergency Standby Engines, Hours of Operation) since non-emergency hours of operation will be limited in the permit conditions to 50 hours per year.

California Environmental Quality Act (CEQA):

The project is ministerial, under the District's CEQA Reg. 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 as specified in District permit handbook chapter 2.3.2 (Stationary Natural Gas Engines) and therefore is not discretionary as defined by CEQA.

Public Notification (Regulation 2-1-412)

The project is located within 1,000 feet from the nearest school and therefore is subject to the public notification requirements of Reg. 2-1-412. The project is not located within an overburdened community. A public notification will be issued before the District makes a final determination on this project.

Best Available Control Technology (BACT)

In accordance with Reg. 2-2-301 (Best Available Control Technology Requirement), BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NO_x, CO, SO₂, PM₁₀, or PM_{2.5}. Based on the emission calculations in Table 1, BACT is not triggered since the maximum daily emission for all the criteria pollutants are less than 10 pounds per day.

Offsets

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons per year of POC or NO_x. Based on the emission calculations in Table 1, offsets are not required for this application per Reg 2-2-302 (Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides).

New Source Performance Standards (NSPS)

S-11 is subject to 40 CFR 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition (SI) Internal Combustion Engines (ICEs), per Section §60.4230(a)(4)(i) because the owner/operator will commence construction after June 12, 2006, and the source is an emergency engine which was manufactured after July 1, 2007 and has a maximum power greater than 500 hp.

The engine will comply with the limits in (40 CFR 60 Subpart JJJJ) Table 1 for emergency spark-ignited engines greater than 130 hp.

Table 4. NSPS Emission Standards vs. S-11 Engine Family Emission Rates

Pollutant	NSPS Emission Standard*	S-11 Emission Rate
NO _x	2.0 g/bhp-hr	0.007 g/bhp-hr
CO	4.0 g/bhp-hr	0.26 g/bhp-hr
VOC	1.0 g/bhp-hr	0.13 g/bhp-hr

*https://www.law.cornell.edu/cfr/text/40/appendix-Table_1_to_subpart_JJJJ_of_part_60

Based on the EPA Annual Emission Certification Data, S-11 complies with NSPS requirements.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

S-11 is subject to 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (RICE). Per 40 CFR 63.6590(c)(1), a new or reconstructed stationary RICE located at an area source must meet the requirements of NSPS (40 CFR 60, Subpart JJJJ) for spark ignition engines. As stated above in the NSPS section, S-11 meets the emissions requirements of NSPS.

Prevention of Significant Deterioration (PSD)

Regulation 2-2-224 defines a PSD project as one at a facility that has the potential to emit 100 tons or more per year of any PSD pollutant. This facility will not have the potential to emit 100 tons or more of any PSD pollutant therefore, this project is not a PSD project.

PERMIT CONDITIONSPermit Condition # 23112 (applicable to S-11)

1. The owner or operator shall operate the stationary emergency standby engine, only to mitigate emergency conditions or for reliability-related activities (maintenance and testing). Operating while mitigating emergency conditions and while emission testing to show

