sierra research

1801 J Street
Sacramento, CA 95811
Tel: (916) 444-6666
Fax: (916) 444-8373

Ann Arbor, MI
Tel: (734) 761-6666
Fax: (734) 761-6755

November 9, 2007

Rick Martin, Air Pollution Control Officer
North Coast Unified Air Pollution Control District
2300 Myrtle Avenue
Eureka, CA 95501

Re: Supplemental Screening Health Risk Assessment for PG&E's Humboldt Bay Repowering Project

Dear Mr. Martin:

In accordance with your recent request to Greg Lamberg, we have prepared a supplemental screening health risk assessment (HRA) for PG&E's proposed Humboldt Bay Repowering Project (HBRP) in Eureka. This screening HRA was performed to evaluate potential health risks that could result from the operation of the ten Wärtsilä 18V50DF engines for up to 1,000 hours (equivalent to 100 hours per engine) per year in diesel mode. We respectfully point out that this type of evaluation is not consistent with guidance from the California Air Resources Board (ARB) for performing risk assessments for Diesel engines, which indicates that the "annual hours of operation for emergency standby engines include the hours of operation for maintenance and testing runs only."[1] As operation of the Wärtsilä engines for testing and maintenance purposes will be limited to 50 hours per engine per year by the District's operating permit and the ARB's Air Toxic Control Measure (ATCM),[2] the assessment of cancer risk based on 50 hours of diesel mode operation that was presented in the September 2007 revised ambient air quality impact assessment is consistent with ARB guidance. Nevertheless, in accordance with the NCUAQMD's request, we have prepared the attached screening HRA; the results are summarized in the table below.

As shown in the table below, the cancer risk from the project is slightly above the significance level of 10 in one million. The chronic health hazard index remains well below the significance level of one.[3] The location where the maximum cancer risk exceeds 10 in one million based on 100 hours per year per engine of operation in diesel mode is limited to an extremely small area in an uninhabited portion of Humboldt Hill, estimated at less than 0.01 square kilometers.

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[1] ARB, "Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines", October 2000, Table 1, p. 11; reaffirmed in "Staff Report: Initial Statement Of Reasons For Proposed Rulemaking, Airborne Toxic Control Measure For Stationary Compression-Ignition Engines", Table V-2, p. 60.

[2] CCR Title 17, Section 93115.

[3] The acute health hazard index is based on one-hour exposure and so is not affected by the number of hours the engines operate in diesel mode in a year.

Screening-Level Risk Assessment Results Based on 100 Hours Per Year Per Engine of Diesel Mode Operation	
Risk Methodology	**HBRP**
Modeled Residential Cancer Risk (in one million)	
Residential: Derived (adjusted) Method	10.7
Modeled Worker Cancer Risk (in one million)	
Worker Exposure: Derived (OEHHA) Method	2.1
Modeled Chronic Impacts	
Chronic HHI	0.06

Methodology

The procedure used for developing model inputs and for modeling the health risks was identical to the procedure described in Appendix C to the September 2007 Revised Air Quality Impact Analysis. The toxic air contaminant (TAC) emission rates and AERMOD and CTDMPLUS model inputs are provided in the attached tables. This screening HRA presents residential cancer risk results obtained using the OEHHA Derived (adjusted) Method.

For carcinogenic substances, the screening HRA considers the risk of developing cancer and assumes that continuous exposure to the cancer-causing substance occurs over a 70-year lifetime. The risk that is calculated is not meant to project the actual expected incidence of cancer, but rather a theoretical upper-bound number based on worst-case assumptions. Cancer risk is expressed in chances per million, and is a function of the maximum expected pollutant concentration, the probability that a particular pollutant will cause cancer (called "potency factors"), and the length of the exposure period. Cancer risks for each carcinogen are added to yield total cancer risk. The conservative nature of the screening assumptions used means that actual cancer risks due to project emissions are likely to be considerably lower than those estimated. Some of those conservative assumptions are outlined below.

- The analysis includes representative weather data over five years to ensure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included. The analysis then assumes that these worst-case weather conditions, which in reality occurred only once in five years, will occur every year for 70 years.

- The power plant is assumed to operate at annual emission conditions that produce the highest ground-level concentrations. In fact, the power plant is expected to operate at a variety of conditions that will produce lower emissions and impacts.

- The analysis assumes that a sensitive individual is at the location of the highest ground-level concentration of power plant emissions continuously over the entire 70-year period. In reality, people rarely live in their homes for 70 years, and, even

if they do, they leave their homes to attend school, go to work, go shopping, and so on.

The point of using these unrealistic assumptions is to consciously overstate the potential impacts. No one will experience exposures as great as those assumed for this analysis. By determining that even this highly overstated exposure will not be significant, there is a high degree of confidence that the much lower exposures that actual persons will experience will not result in a significant increase in cancer risk. In short, the analysis ensures that there will not be significant public health impacts at any location, under any weather condition, under any operating condition.

If you have any questions regarding this analysis or wish to discuss these results further, we would be pleased to respond.

Sincerely,

Gary Rubenstein

attachments

cc: Greg Lamberg, Radback Energy
Scott Galati, Galati and Blek
Susan Strachan

Table 8.1A-8A
HBRP
Annual and Maximum Hourly Non-Criteria Pollutant Emissions for Wärtsilä Reciprocating Engines
Rev 11/07 to evaluate 100 hrs per engine per year of Diesel fuel firing

Pollutant	Natural Gas Emission Factor (1) lb/MMscf	Controlled Natural Gas Em Factor (2) lb/MMscf	Diesel Emission Factor (3) lb/Mgal	Controlled Diesel Em Factor (2) lb/Mgal	Maximum Hourly Emissions per Engine, lb/hr (5) Nat Gas Firing (5)	Diesel Firing (6)	ICE Total Annual Emissions (7) tpy
Ammonia	(4)	n/a	(4)	n/a	1.93	2.11	62.88
Propylene	5.38E+00	3.23E+00	3.85E-01	2.31E-01	0.46	0.25	14.57
Hazardous Air Pollutants							
Acetaldehyde	5.29E-01	3.17E-01	3.47E-03	2.08E-03	0.04	2.26E-03	1.43
Acrolein	5.90E-02	3.54E-02	1.07E-03	6.42E-04	4.99E-03	6.98E-04	0.16
Benzene	2.18E-01	1.31E-01	1.01E-01	6.06E-02	0.02	6.59E-02	0.60
1,3-Butadiene	3.67E-01	2.20E-01	–	–	0.03	–	0.99
Diesel PM (8)	–		–	–	–	5.56	2.78
Ethylbenzene	7.11E-02	4.27E-02	–	–	0.01	–	0.19
Formaldehyde	2.36	inc	1.32E-02	inc	0.33	1.44E-02	10.61
Hexane	1.13E+00	6.80E-01	–	–	0.10	–	3.06
Naphthalene	2.51E-02	1.51E-02	1.63E-02	9.78E-03	2.22E-03	1.06E-02	0.07
PAHs (as B(a)P) (9)	1.71E-05	1.03E-05	6.21E-05	3.73E-05	1.81E-06	4.05E-05	5.07E-05
Toluene	2.39E-01	1.43E-01	3.74E-02	2.24E-02	2.04E-02	2.44E-02	0.65
Xylene	6.46E-01	3.88E-01	2.68E-02	1.61E-02	5.48E-02	1.75E-02	1.75
Total HAPs (excluding Diesel PM) =							19.51

Notes:

(1) All factors except hexane and formaldehyde are CATEF mean values for natural gas-fired IC engines. Hexane is from AP-42 Table 3.2-2; formaldehyde is based on vendor data.

(2) 40% control efficiency for oxidation catalyst applied for all TACs except formaldehyde. Source: BAAQMD PDOC for Eastshore Energy Center, April 30, 2007. Formaldehyde emission factor provided by vendor reflects ox cat control.

(3) All factors are CATEF mean values for large Diesel engines (SCC 20200102).

(4) Based on 10 ppm ammonia slip from SCR system.

(5) Based on maximum ICE firing rate of 143.9 MMBtu/hr and fuel HHV of 1,021.1 Btu/scf of natural gas and 0.79 MMBtu/hr and fuel HHV of 136,903 Btu/gal for pilot Diesel fuel

0.14088	MMscf/hr natural gas
0.01	Mgal/hr Diesel fuel

(6) Based on maximum ICE firing rate of 148.9 MMBtu/hr and fuel HHV of 136,903 Btu/gal for Diesel fuel

1.09	Mgal/hr Diesel fuel

(7) Based on maximum ICE firing rate (from (3)) for 6447 hrs/yr on natural gas and pilot Diesel fuel.

901.2	MMscf/yr of natural gas
14.1	Mgal/yr Diesel fuel

(8) Based on 100 hrs per engine per yr of backup Diesel fuel operation; Front half only, per ATCM.

(9) Emission factors for individual PAHs weighted by cancer risk relative to B(a)P and summed to obtain overall B(a)P equivalent emission rate for HRA.

	Mean EF		PEF Equiv.	PEF-Weighted EF	
	Nat Gas	Diesel		Nat Gas	Diesel
PAHs (as B(a)P)					
Benzo(a)anthracene	5.88E-05	5.03E-05	0.1	5.88E-06	5.03E-06
Benzo(a)pyrene	2.70E-06	1.81E-05	1	2.70E-06	1.81E-05
Benzo(b)fluoranthrene	4.09E-05	7.96E-05	0.1	4.09E-06	7.96E-06
Benzo(k)fluoranthrene	7.83E-06	1.56E-05	0.1	7.83E-07	1.56E-06
Chrysene	1.43E-05	1.06E-04	0.01	1.43E-07	1.06E-06
Dibenz(a,h)anthracene	2.70E-06	2.43E-05	1.05	2.84E-06	2.55E-05
Indeno(1,2,3-cd)pyrene	7.17E-06	2.89E-05	0.1	7.17E-07	2.89E-06

Table 8.1C-2A

HBRP

Calculation of Modeling Inputs for Wärtsilä Reciprocating Engine Cancer Risk Assessment

Rev 011/07 to evaluate 100 hours per engine per year on Diesel fuel

		Derived (Adjusted) Method		Worker Exp: Derived (OEHHA) Method	
Compound	Annual Average Emissions Per Engine g/s	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)
Ammonia	1.81E-01	0	0	0	0
Propylene	4.19E-02	0	0	0	0
Acetaldehyde	4.12E-03	2.90E-06	1.19E-02	5.72E-07	2.35E-03
Acrolein	4.59E-04	0	0	0	0
Benzene	1.72E-03	2.90E-05	4.98E-02	5.72E-06	9.82E-03
1,3-Butadiene	2.85E-03	1.74E-04	4.97E-01	3.43E-05	9.79E-02
Diesel PM	8.00E-03	3.19E-04	2.55	6.29E-05	5.03E-01
Ethylbenzene	5.53E-04	0	0	0	0
Formaldehyde	3.05E-02	6.08E-06	1.86E-01	1.20E-06	3.66E-02
Hexane	8.82E-03	0	0	0	0
Naphthalene	1.99E-04	3.48E-05	6.91E-03	6.86E-06	1.36E-03
PAHs (Note 1)	1.46E-07	3.98E-02	5.81E-03	1.47E-02	2.15E-03
Toluene	1.87E-03	0	0	0	0
Xylene	5.03E-03	0	0	0	0
			3.31E+00 per ug/m3		6.53E-01 per ug/m3

Notes:

(1) Emission rates for individual PAHs weighted by risk relative to B(a)P. See Table A-8.

Table 8.1C-3A
HBRP
Calculation of Modeling Inputs and HHIs for Wärtsilä Reciprocating Engine Chronic Risk Assessment
Rev 11/07 to evaluate 100 hours per engine per year on Diesel fuel

	Chronic Health Impacts		
Compound	Annual Average Emissions, g/s	HARP Chronic HI (per ug/m3)	Chronic HHI Model Input (per ug/m3 per g/s)
Ammonia	1.81E-01	5.00E-03	9.04E-04
Propylene	4.19E-02	3.33E-04	1.40E-05
Acetaldehyde	4.12E-03	1.11E-01	4.57E-04
Acrolein	4.59E-04	1.67E+01	7.67E-03
Benzene	1.72E-03	1.67E-02	2.87E-05
1,3-Butadiene	2.85E-03	5.00E-02	1.43E-04
Diesel PM	8.00E-03	2.00E-01	1.60E-03
Ethylbenzene	5.53E-04	5.00E-04	2.77E-07
Formaldehyde	3.05E-02	3.33E-01	1.02E-02
Hexane	8.82E-03	1.43E-04	1.26E-06
Naphthalene	1.99E-04	1.11E-01	2.20E-05
PAHs	1.46E-07	--	--
Toluene	1.87E-03	3.33E-03	6.22E-06
Xylene	5.03E-03	1.43E-03	7.19E-06
		Total =	2.10E-02

Table 8.1C-6A
HBRP
Summary of Modeling Input Values for Screening HRA
Rev 11/07 to evaluate 100 hours per engine per year on Diesel fuel

Unit	Derived (Adjusted) Method Cancer Risk (Res)	Derived (OEHHA) Method Cancer Risk (Worker)	Chronic HHI Model Input (per ug/m3)
Wärtsilä Reciprocating Engines (per engine	3.308E+00	6.533E-01	2.102E-02
Black start Diesel engine	1.210E-02	2.386E-03	7.587E-06
Diesel fire pump engine	1.487E-02	2.932E-03	9.323E-06

All modeling input values are in units of per ug/m3

Stack Parameters				
	Stack Diam (m)	Stack Ht (m)	Exhaust Temp (deg K)	Exhaust Velocity (m/s)
Wärtsilä Reciprocating Engines (Case 1G)	1.620	30.480	663.556	27.152
Black start Diesel engine	0.152	3.048	769.611	87.073
Diesel fire pump engine	0.127	12.192	838.556	44.856