Michael Toth
2511 Bradford Ave,
Hayward, CA 94545

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To: Bill Pfanner, California Energy Commission and Eastshore Energy Center Project Staff

Re: Preliminary Staff Assessment for Eastshore Energy Center

I am responding to the publication of your Preliminary Staff Assessment for the Eastshore Energy Center as part of the public comment process. Please consider my comments below in your consideration of the Eastshore application and include them in the public record. The specific actions I am suggesting that the CEC take are underlined, and supported by the other comments.

Public Health- Toxic Air Contaminants

I have reviewed your health risk analysis with respect to toxic air contaminants. I disagree with your conclusion that this plant will not pose significant health risks to the neighboring community. My disagreement is based on data from the US EPA and basic statistical methods. Please address the following concerns:

Conditions of Certification

I applaud your decision to impose a requirement of certification that Eastshore conduct source tests for all toxic air contaminants across all 14 engines within 1 year of commencing operation. Should this project be permitted, I strongly urge you to maintain this condition as stated- that all toxic contaminants be tested, and that all engines be tested.

In light of the novelty of this type of engine to the state of California and to operation in heavily populated areas, in order to minimize the danger to public health should these engines not perform as advertised I suggest that the time frame in which the applicant must complete these tests be reduced to 120 days after operation commences, and that no more than one untested engine be in operation at any given time. Additionally, please ensure that all test measurements of toxic air contaminants performed under this condition be made available to the public.

Engine Variability

The following quote is from the US EPA AP-42 Final Section 3.2.3 "Natural Gas Fired Reciprocating Engines", page 3.2-3 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf) "It should be emphasized that the actual emissions may vary considerably from the published emission factors due to variations in the engine operating conditions. This variation is due to engines operating at different conditions, including air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors. It is not unusual to test emissions from two identical engines in the same plant, operated by the same personnel, using the same fuel, and have the test results show significantly different emissions. This variability in the test data is evidenced in the high relative standard deviation reported in the data set."

Neither the PSA authored by CEC staff nor the PDOC issued by the BAAQMD have addressed, much less quantified this variability, which the US EPA sought to emphasize. The CEC and the BAAQMD *have not demonstrated* that the statistically probable emissions from this plant will not exceed the reference exposure level (RELs) for Toxic Air Contaminants (or Hazardous Air Pollutants, in EPA terminology), and thus has no basis to claim that this plant will not have a significant effect on public health.

The reason that this variability has not been addressed within the Health Risk Screening Analysis is that the toxic emissions factors sourced from the CATEF database operated by CARB, which form the basis for the analysis, are themselves *based on an insufficient number of sources to provide a basis for statistical prediction.* Specifically, the CATEF toxic emissions factors for Natural Gas Fueled Internal Combustion Engines greater than 650 horsepower, 4-stroke lean burn are based on only *two sources*, and are associated with the following description: "Source test data taken from a small number of facilities, and there may be reason to suspect that the facilities do not represent a random sample of the industry (< 3 sources)."

Under the methodology that the CEC and the BAAQMD have used, the appropriate conclusion is that the evaluation of public health risk from toxic air contaminants is inconclusive, and that a Health Risk Screening Analysis based on a statistically valid set of data must be performed in order to justify the construction of this plant in a densely populated urban area. I strongly urge the commission not to permit the applicant to attempt to gain this statistically valid set of data by conducting their experiment in the densely populated urban area of West Hayward.

Alternate Analysis Under AP-42

The US EPA published an emissions factors database called AP-42 that performs a similar function to the CARB CATEF database- measuring toxic emissions factors for identical engine/fuel categories. Under the California Air Toxics "Hot Spots" program, it is suggested that CARB test methods and data be generally preferred over EPA test methods and data, but the two datasets are interchangeable insomuch as they are measuring emissions factors for the same substances over comparable sources, using accepted methodologies.

For the type of engine and fuel found in the Eastshore project, "Natural Gas Fueled Internal Combustion Engine greater than 650hp, 4 stroke, lean burn", the US EPA AP-42 database contains a much larger source population than the CATEF database. The toxic air contaminants that represent the highest proportion of the health risk (the drivers) under the EPA method are associated with the following rating description "A - Excellent: Developed only from A-rated test data taken from many randomly chosen facilities in the industry population. The source category is specific enough so that variability within the source category population may be minimized."

The EPA publishes the following guidelines for use of emissions factors published under AP-42, with its "WebFire" database tool: "If you must apply emissions factors for site-specific applications, we strongly recommend due consideration of the uncertainty inherent in the data. Applying emissions factors without accounting for uncertainty will result in doubtful applicability determinations, ineffective emissions reductions requirements, and poorly supported compliance determinations or enforcement actions." and "Approaches to accounting for uncertainty include adjustments based on statistical assessments addressing bias and imprecision for both pollutant emissions control and process operations or activities variability. Under such options, we believe it appropriate to consider the quality and quantity of the source test data underlying the emissions factors and to consider the variations of

emissions control and process operations between sources within the same category. With this information, we think it prudent to apply standard statistical adjustments in the use of emissions factors consistent with the goals of your specific application"

In light of the apparent superiority of EPA AP-42 data over CARB CATEF data for this class of engine, I suggest that AP-42 database, in conjunction with an appropriate statistical adjustment, be used as the basis for the Health Risk Screening Analysis and any other relevant computations, as opposed to the mean measurements from the CATEF database. Given the fact that human health is at stake, an appropriate statistical adjustment is to use an upper bound of at least 2 standard deviations above the mean value provided in the AP-42 database. This provides reasonable assurance that the public health is protected by demonstrating that there is an approximately 95 percent probability that exposure to toxic air contaminants will fall under their respective RELs.

The AP-42 database provides an RSD (Relative Standard Deviation) and a MEAN measurement for each toxic air contaminant. This upper bound of 2SD can be calculated using the following simple formula: MEAN + (MEAN * 2 * (RSD/100)) where RSD is expressed as a percentage. (RSD is the statistical Standard Deviation expressed as a percentage of the mean).

Acrolein

Acrolein is a toxic by-product of combustion, and a compound used to manufacture tear gas. It has high acute toxicity. The OEHHA REL (Reference exposure limit) for acute (1 hour) exposure to acrolein is **0.19μg/m^3**.

The BAAQMD, in the HRSA it published in its PDOC, conducted using the unadjusted mean emissions factor for acrolein from the CATEF database of 5.90e-02 lbs/MMCF, calculated a maximum hourly concentration of .033μg/m^3 for the nearest residential receptor, and a .077μg/m^3 for the nearest worker receptor, assuming a mitigation of 40% for the emissions control system. In the HRSA computed by the BAAQMD, acrolein is the driver (most significant contributor) of the health risk computation, which is calculated as insignificant.

Aside from the previously mentioned issues regarding the inadequacy of the CATEF database concerning this type of engine, there are issues specific to the measurement of acrolein that serve to significantly underestimate the risk to public health of this project.

The BAAQMD states that "Currently, CARB does not have certified emission factors or an analytical test method for acrolein. Therefore, since the appropriate tools needed to implement and enforce acrolein emission limits are not available, the District will not conduct a HRSA for emissions of acrolein. In addition, due to the significant uncertainty in the derivation, OEHHA is currently re-evaluating the acute REL for acrolein. When the necessary tools are developed, the District will re-evaluate this specific evaluation procedure and the HRSA guidelines will be revised." The BAAQMD helpfully calculated the acrolein impact as a courtesy for the Eastshore PDOC, but publishes a version that excludes acrolein as its "official" HRSA.

The AP-42 provides a different perspective on acrolein, through AP-42. The following quote is from the US EPA AP-42 Background Document, chapter 3.2 "Natural Gas Fired Reciprocating Engines", page 3.10 (http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s02.pdf) "The EPA has identified that for lean-burn engines, the California Air Resource Board (CARB) 430 measurement method for quantifying aldehyde emissions may have interference problems with the 2, 4-dinitrophenylhydrazine

(DNPH) solution. This is due to the expected high concentrations of N2 and O2 percent in the engine exhaust stream. In such cases, the reported aldehyde measurements may be biased low. Emission factors based only on FTIR are presented in the AP-42 section for lean burn engines. Separate factors for FTIR and CARB 430 are presented in this document. However, the EPA recommends aldehyde emission factors that are based on FTIR measurements for lean-burn engines. The FTIR is a real-time measurement method approved by the EPA and is capable of monitoring aldehyde emissions."

The AP-42 publishes a mean emissions factor of 5.24e+00 lbs/MMCF for acrolein. This is *88.8 times* the amount reported using the insufficient sample data using the insufficient measurement method used in CATEF. Alone, this would result in a maximum hourly concentration of 2.93μg/m^3 for the nearest residential receptor, and a 6.84 μg/m^3 for the nearest worker receptor, assuming a mitigation of 40% for the emissions control system. *This is 15 times the REL for residents, and 36 times the REL for workers.*

Applying the RSD% (Relative Standard Deviation) of 58.7% published in AP-42 for Acrolein, to measure the 95th percentile of the emissions factor with respect to the REL, we calculate a statistical upper bound (for the 95th percentile = second standard deviation) of 5.24 + (5.24 * .587 * 2) = 11.39 lbs/MMCF. We can say that there is a 95% chance that Eastshore or any other plant of the same size and engine class will emit less than 11.39lbs/MMCF of acrolein.

11.39 lbs/MMCF, a statistic derived from data published by the EPA AP-42 measured by test methods the EPA deems reliable and backed by a large sample size, and calculated to be a reasonable upper bound to determine risk to human health, exceeds the CATEF figure used for this project's health risk analyses by a factor of 193 (One Hundred Ninety Three) times, or over 3 orders of magnitude.

At this emission factor, we can calculate a maximum hourly concentration of 6.369μg/m^3 for the nearest residential receptor, and a 14.861μg/m^3 for the nearest worker receptor, assuming a mitigation of 40% for the emissions control system. Respectively, these amounts exceed the REL by multiples of approximately 33.5 and 78.2.

While engines are starting, or being tuned, some time may elapse before the SCR emissions control system is activated. During this time, emissions of acrolein are unmitigated, resulting in a maximum hourly concentration of 15.923μg/m^3 for the nearest residential receptor, and a 37.153μg/m^3 for the nearest worker receptor. Respectively, these amounts exceed the REL by multiples of approximately 83.9 and 195.5.

In light of the high factor of REL exceedance calculated using EPA data and test methods in leu of the data and methods self described by CARB as inaccurate and not representing a random sample, the CEC should conduct a an analysis of the effects of this concentration of acrolein on workers, schools and residences, and should provide a mechanism for monitoring reporting, and publishing acute effects such as increased incidence of eye and throat irritation that coincide with plant operation, particularly with respect to local elementary and middle schools.

PM and Cancer Risk

The CEC has reviewed the JAMA study (Pope, et al, *JAMA.* 2002;287:1132-1141.) which found that "Each 10-μg/m^3 elevation in fine particulate air pollution was associated with approximately a 4%, 6%, and 8% increased risk of all-cause, cardiopulmonary, and lung cancer mortality, respectively." In

reviewing this literature, the CEC has stated that it believes that the cause of this epidemiological result involves carcinogenic toxic air contaminants adhering to fine particulate matter, and as such, the carcinogenicity of the PM emitted by the Eastshore project has already been taken into account via the Health Risk Screening Analysis.
The CEC should make public the scientific evidence it has relied upon to support this claim, if such evidence exists. In addition, to avoid the possibility that toxic air contaminants will be "double counted", the CEC should conduct and publish a parallel cancer risk computation based solely on the expected PM2.5 concentration (excluding toxic air contaminants) contributed by the Eastshore and the cumulative Eastshore/Russell City projects, factored by the 8%/10-$\mu g/m^3$ increased lung cancer risk identified in the JAMA study to account for any additional risk in excess of the risk contributed by toxic air contaminants identified in the original health risk analysis.

Noise

Widely reported preliminary findings from the World Health Organization (WHO) indicate that long-term exposure to traffic noise may account for 3 per cent of deaths from ischaemic heart disease in Europe. (http://www.guardian.co.uk/science/2007/aug/23/sciencenews.uknews).

The CEC, in its PSA, has determined that nighttime noise levels are expected to increase as much as 6dbA over existing ambient levels, to a level of 50dbA. It predicts that the combined increase with the Russell City Entergy Center will be 7dbA over existing ambient levels. The CEC then goes on to downplay the significance of the result by stating that the actual field measurements will likely result in a lower value because most models overestimate noise levels, but provides no basis for this conclusion. The CEC also indicates that the project is not likely to operate during late nights, despite the fact that the plant is permitted to do so, as a reason for dismissing the significance of the noise impact.

The CEC itself includes copy in its Noise Appendix A indicating that noise levels above 45dbA at night can result in the onset of sleep interference effects. As 6dbA represents a doubling of perceived volume, and a quadrupling of noise power, the downplaying of the significance of the result by indicating that published numbers may be in error, and the error will be biased towards the down-side, and that project won't operate as permitted creates the appearance of subjective bias towards the project applicant and calls into question the independence of CEC staff from applicant. The CEC should either remove these subjective criteria from the determination of significance or impose permit restrictions that prevent the plant from operating during nocturnal hours.

No support has been provided for the statement that the plant vibration will weaken to the threshold of imperceptibility before it reaches the plant boundaries. Such a statement would require some amount of geological analysis for support. The CEC should document the scientific basis for this determination.

In addition, no analysis has been presented that indicates the impact of noise on local businesses. The CEC should analyze the impact of project noise on neighboring offices, such as the Fremont Bank processing center next to the project site.