BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1:

SUMAS ENERGY 2 GENERATION FACILITY

PRE-FILED TESTIMONY OF JERRY G. LILLY

ISSUE:

NOISE

SPONSOR:

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Could you please identify yourself?

My name is Jerry Lilly. I am President of JGL Acoustics, Inc. an acoustical consulting firm located in Issaquah, WA.

Would you please summarize your experience and education relevant to your work?

I have a Master of Science degree in Engineering Acoustics from Penn State University (1975) and a Professional Engineer=s License in Acoustical Engineering (Oregon, 1983). I have been providing acoustical consulting services to clients since 1975, and I started my own consulting firm in 1983.

Are you familiar with the Sumas Energy 2 Generation Facility proposal submitted to the Energy Facility Site Evaluation Council by Sumas Energy 2, Inc. (SE2)?

Yes.

What specific issues did you focus on with regard to this proposal?

I reviewed the noise study prepared on behalf of the proposed power generation project near Sumas, WA. The original noise study (dated 1/10/00) was prepared by MFG, Inc. at the direction of Mr. Eric Hanson.

What is your overall opinion of the proposal with regard to the noise impacts?

I have two primary concerns about the noise impacts of this facility. My first concern is whether it will be in compliance with the legal limits on noise. Second, even if it is in compliance with noise limits, there could be a significant noise problem caused by low frequency noise and/or the generation of tones (which weren=t considered by the Applicant).

Why are you concerned about whether this facility will be in compliance with the legal limit on noise?

In this case, a computer program was used to predict the power plant noise levels at four selected residential receptor locations. A Areceptor location@ is a place that the engineer picks to evaluate the level of noise. It can be a house, a property line, or any place where noise impacts from a facility should be measured.

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That the authors of the study used only four residential receptor locations for this very broad area is surprising. The computer program they used can easily compute noise levels at numerous receptor locations fairly quickly.

The noise study predicted the power plant noise levels under two different atmospheric conditions. Like the locations, the choice of only two atmospheric conditions is surprising. The reason it=s important to consider different atmospheric conditions is that changes in temperature (as a function of altitude) affects sound propagation. That is, fluctuating temperature profiles can increase or decrease noise impacts. A source might emit a very constant level of noise, but a receiver may hear fluctuating noise because of fluctuations in atmospheric conditions. One condition used in the noise study was the Astable atmosphere,@ where the temperature increases 2 degrees C for each 100 meters of elevation. The other condition was called a Aneutral atmosphere,@ where the temperature decreases 1 degree C for each 100 meters of elevation. Certainly, one can expect a wide variety of atmospheric conditions throughout the year, yet there is nothing in the document to support the idea that these conditions represent the average or the extremes one might see during the life of the project. I was also surprised to see that the predicted noise level only varied by a few decibels between the two atmospheric conditions that were evaluated. I would have expected to see more of a variation here.

All in all, there is a strong possibility that the legal limit will be surpassed at receptor locations not considered or when atmospheric conditions cause facility noise levels to exceed predictions.

Also - this science is not exact. When you make assumptions about the level of noise from equipment, it cannot always be predicted accurately. Also, the level of reduction that will occur from mitigation cannot be predicted accurately. In this study, the predicted noise levels do not leave much of a safety margin. That is, they are very close to the noise ordinance nighttime limit of 50 dBA at the residential receiving properties. In fact, all locations are within 2 dBA of the nighttime maximum limit with the assumed stable atmosphere. Obviously, the predicted noise levels are close to the noise ordinance limit because the noise mitigation has been designed to meet this level at all selected receiver locations under both atmospheric conditions. This is understandable, but what happens if the noise mitigation materials do not perform up to their laboratory test data? In fact, it is quite common for field performance to fall short of laboratory performance. If this occurs, and it most certainly will, will the

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power plant noise levels exceed the nighttime limit? And what about different atmospheric conditions? If the temperature inversion is more extreme than assumed, it is likely that noise levels will be even higher than predicted.

Your second concern about this proposal was that there could be a significant noise problem caused by low frequency noise and/or the generation of tones, please explain that concern.

Measurement of an AA weighted@ sound level is a frequency filtering technique that is commonly used to come up with a single number to describe the level or loudness of a sound. The A-weighting filter attempts to approximate the frequency response of the human ear, but it is by no means an exact measure of perceived loudness. But when you limit yourself to this one number you lose important information. (An analogy would be using <u>one</u> sentence to describe the entire novel AMoby Dick.@) In particular, you lose knowledge of the presence of low frequency noise and/or the presence of audible tones.

Is it possible that there may be a significant noise problem in the community caused by this facility?

Yes. Even if the noise mitigation works exactly as planned, and even if the atmosphere behaves as modeled, this does not mean that there will not be a significant community noise problem from the proposed facility. In fact, large industrial facilities similar to this often generate objectionable noise into nearby communities without exceeding the dBA noise limits. This usually occurs if the facility generates high levels of low frequency noise or if the facility generates strong tones.

Because of the nature of the A-weighted filter, high levels of low frequency noise can go undetected by the computer models and the sound level meters. ALow frequency@ noise is probably best recognized if you picture a car driving by with its windows closed, but with a loud stereo playing inside. When you hear the deep boom of the base - that is low frequency noise. Low frequency noise can have a lot of impact - it can shake walls, rattle windows, cause extreme annoyance, cause headaches in some people, and cause stress. Low frequency noise levels can be high enough to cause these impacts without exceeding the 50 dBA noise ordinance limit. For example, a low frequency tone at 30 Hz (Hz is the unit of frequency B the units of frequency used to be cycles/second, but this was changed in the early 1900=s to Hz in honor of the famous German scientist Heinrich Hertz) could exceed a sound pressure level of 85

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dB in the residential community without violating the 50 dBA noise ordinance limit. This sound level is sufficient to rattle the windows of some residential buildings, and it is certainly sufficient to cause significant annoyance and sleep interference. The A-weighted level of an 85 dB tone at 30 Hz is only 46 dBA. If the machinery associated with this project is capable of generating this level of noise (above 80 dB) at low frequencies in the community, there is a significant potential for low frequency noise problems. Because of this concern, I strongly recommend that someone examine the low frequency noise radiation characteristics of the proposed project.

The other potential noise problem relates to the generation of tones. Tones are sounds that have most of its energy at a single frequency. You can have tones at any frequency - low or high. For example, a Atone@ is emitted when you strike a piano key, or when you pick up the phone. Most emergency vehicle sirens these days use a high frequency tone whose frequency and level oscillate to further attract attention.

Tones are a particular problem because they can be an extreme annoyance even when they are at a low level. If the tones are strong enough at the source, they can be heard for great distances. Tones are particularly troublesome because they have a piercing characteristic that is especially annoying. Tones can also be heard at levels as low as 10 dBA below the overall ambient noise level.

It appears that the applicant did not look at this facility=s potential for generating tones. This should be done because the equipment planned for this project could have a significant problem with the generation of tones. It=s very possible that tones from this facility could keep people awake at night.

If an industrial facility goes in, and it=s A-weighted sound levels are within the legal limits, but there is still a community noise problem - it is typically caused by a high level of low frequency noise or the generation of tones. In general, it is good design practice to mitigate tones to a point where they are at least 10 dB below the overall design goal. For example, if your goal is to achieve the 50 dBA nighttime noise level at a receiver location, all tones should be attenuated so that any one tone is not higher than 40 dBA at that location. It doesn=t appear that tones have been considered in this noise study, and therefore, I recommend that this issue be investigated further.

END OF DIRECT TESTIMONY OF WITNESS

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