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Nancy Rader
Executive Director
California Wind Energy Association
2560 Ninth Street
Suite 213-A
Berkeley, CA 94710

Dear Ms. Rader,

I have completed a review of the California Energy Commission document entitled *Avian/Wind Statistical Peer Review Project, Consultant Report*, which was prepared by the California Institute for Energy and Environment and dated December 2006 (termed the "CEC Consultant Report"). The CEC Consultant Report reviewed the document entitled *Developing Methods to Reduce Bird Mortality in the Altamont Pass Wind Resource Area*, by K. Shawn Smallwood and Carl Thelander (termed the "Altamont report"). The CEC Consultants Report summarizes the comments of three peer reviews performed on the Altamont report. Each of the three peer review teams consisted of experts in statistics and ecology. The three peer reviews are included as attachments to the CEC Consultant Report.

The objectives of my review were to (1) examine the Executive Summary of the CEC Consultant Report to verify that the peer reviewers' comments were properly referenced, (2) compare the conclusions of the peer reviews to those generated by myself (October 11, 2006 and October 24, 2006) and Dr. Eric Smith (September 18, 2006) for CalWEA, and (3) provide comments on the CEC Consultant Report's major recommendations.

The following are major findings of my review of the CEC Consultant Report:

- A. The detailed findings of the peer reviewers are consistent with those provided by myself and Dr. Eric Smith. After a close review of the comments provided from all reviewers, I find that the comments are remarkably similar in both context and detail. All of the reviewers found major issues in the survey design, the implementation of the survey methods, the statistical analysis of the data, presentation of the survey data and associated analysis results, and credibility of the report's findings. In general, myself, Dr. Smith, and the peer-review teams all conclude that the study is flawed and the study conclusions are not supported by the data or analysis.
- B. The Executive Summary of the report, however, does not present the peer reviewers' comments in a comprehensive manner, and minimizes the impact of the peer reviewers' technical review on the credibility that can be attributed to the findings and conclusions of the Altamont report. I found a large amount of detail and technical content in the peer review team's comments that is not properly referenced in the Executive Summary.
- C. Given the flawed nature of the Altamont report, I find it difficult to draw information from the report's findings that will pave the way for future research. I continue to believe that the data collected during the Altamont survey could, after a thorough quality assurance examination,

be re-analyzed using correct statistical procedures. The results from this re-analysis could then be used as the basis for future research funding.

The three peer reviews consist of several hundred pages of comments. Many of the comments cast doubt on the credibility of the Altamont report's findings and conclusions. In many cases, the Executive Summary does not convey the seriousness of the peer reviewers' findings. To illustrate the point, consider this statement from the Executive Summary (p. ii):

In general, all of the reviewers were explicit in pointing out that the authors had taken on an important issue and had done a credible job with the resources that were available to them. The reviewers also recognized study difficulties related to the limited ability to manipulate the site to meet the data collection requirements for statistical analyses.

In contrast to the above statement, the peer reviewers explicitly provided comments that lead to the conclusion that the authors did not provide a credible statistical evaluation of the Altamont data, which is consistent with the findings of the reviews by Dr. Smith and myself. For example:

Comments from Peer-Review Team 1:

- *The study furthermore has three methodological flaws that may alter the conclusions drawn from the study: 1) turbine strings were sampled haphazardly, 2) results were not adjusted for observer ability, and 3) adjustments for scavenger removal relied on other studies and did not account for differences in vegetation type or height. (CEC Consultant Report, Attachment A, p. 2)*
- *Furthermore, the authors use one-way ANOVA seemingly without regard for the underlying assumptions of the procedure, which include normality of error distribution and homogeneity of variance across variable levels. (CEC Consultant Report, Attachment A, p. 7)*
- *The LSD tests described on p.38 indicate that the relationship between distance and height is not linear (i.e., the 43-m tower mean is less than the intermediate height towers.) So the presentation of this figure, and the analysis it represents is meaningless. (CEC Consultant Report, Attachment A, p. 10)*
- *The predictive model is flawed. The variables examined are clearly not independent and so summing the accountable mortality values across variables (p. 188) must necessarily overestimate the predicted impact. All model results are suspect because of this flaw. Furthermore, this is a complex study with many potential confounding factors, yet the development of the predictive model strikes us as simplistic and fails to account for such effects. (CEC Consultant Report, Attachment A, p. 20)*

Comments from Peer-Review Team 2:

- *Much effort went into collecting massive amounts of data; however, the authors should have focused more effort on study design and collected their data more wisely. Likewise, the data analyses could have been more thoughtful and sophisticated. The statistical analyses are applied in an automated manner that fails to fully utilize the data at hand and ignores potential confounding of variables. It seems like many of the statistics were calculated just for the purpose of producing statistical tables to the point of data dredging. Furthermore, the mathematical assumptions behind statistical tests like one-way ANOVA are ignored and thus the reported P-values should be treated as approximations. The large number of statistical tests likely resulted in many Type I errors; therefore, statistically significant findings should be treated more as an indicator of what should be explored in future studies. (CEC Consultant Report, Attachment B, p. 5)*

- *It is likely that some number of the reported test results were statistically significant. But due to the very large number of univariate tests conducted, there is a high probability that a number of “significant” results were based on pure chance. (CEC Consultant Report, Attachment B, p. 8)*
- *The authors use simple linear regression to show that mortality counts increase linearly with turbine tower height. The mathematical assumptions behind linear regression are not valid with this particular dataset (likely nonlinearity, non-normal distribution of errors, unequal variances) thus inadequately demonstrating statistically conclusive evidence that mortality counts are greater for taller turbines. (CEC Consultant Report, Attachment B, p. 13)*
- *The authors write, “...we recently found that 85%-88% of the carcasses occurred within 50m of the wind towers.” The absence of any described systematic method of how they searched beyond 50m makes this estimate questionable. (CEC Consultant Report, Attachment B, p. 18)*
- *The authors state that, of the 1162 carcasses whose fatality was attributed to the wind turbines, 198 were more than 90 days old. Table 3.1 on pp. 64 and 65 counts fatalities as Type A (both fresh and old) and Type B (fresh; used to estimate mortality). The difference between Type A and Type B should be the number of carcasses older than 90 days. In fact the difference is $1162 - 923 = 239$ which is larger than the 198 reported on p. 52. What happened to the other 41? Bats account for some, but not all. (CEC Consultant Report, Attachment B, p. 21)*

I note that comments from the Peer Review Team 3 were consistent in content and tone to the above comments from Review Teams 1 and 2. There are many other comments contained in the peer reviews that serve to negate the findings and conclusions of the Altamont Study. In large part, Dr. Smith and I provided comments that are consistent with these peer reviews.

In addition, I found (in my October 11, 2006, review) many unexplained inconsistencies between the SPSS data used in the Altamont report analysis and the field collection forms generated during the Altamont site sampling. The peer reviewers did not comment on these basic data quality issues. The peer-review teams may not have been aware that these issues existed.

Based on a review of the CEC-conducted peer reviews, and based on the reviews of Dr. Smith and myself, I can only conclude that the Altamont report’s findings and conclusions are not currently supported by the technical analyses provided in the report. The large number of survey design and statistical errors in the report that were consistently noted by all reviewers serve to provide little or no credibility to the Altamont report’s findings

Sincerely,

submitted by email

William Warren-Hicks, Ph.D.
CEO