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STATE OF CALIFORNIA

Energy Resources
Conservation and Development Commission

In the Matter of:	**DOCKET NO. 09-AFC-07C**
Petition For Amendment for the **PALEN SOLAR ELECTRIC GENERATING SYSTEM**	**DECLARATION OF WALLY ERICKSON**

I, Wally Erickson, declare as follows:

1. I am presently employed by West Inc.

2. A copy of my professional qualifications and experience was included with my Rebuttal Testimony and is incorporated by reference in this Declaration.

3. I prepared the attached supplemental rebuttal testimony relating to Biological Resources – Avian for the Petition for Amendment for the Palen Solar Electric Generating System (California Energy Commission Docket Number 09-AFC-07C).

4. It is my professional opinion that the attached prepared testimony is valid and accurate with respect to issues that it addresses.

5. I am personally familiar with the facts and conclusions related in the attached prepared testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury, under the laws of the State of California, that the foregoing is true and correct to the best of my knowledge and that this declaration was executed on ______July 15______ 2014.

Wallace P. Erickson

Wally Erickson

STATE OF CALIFORNIA

Energy Resources
Conservation and Development Commission

In the Matter of: Petition For Amendment for the **PALEN SOLAR ELECTRIC GENERATING SYSTEM**	**DOCKET NO. 09-AFC-07C** **DECLARATION OF KEN LEVENSTEIN**

I, Ken Levenstein, declare as follows:

1. I am presently employed as a Project Manager by West Inc.

2. A copy of my professional qualifications and experience was included with my Supplemental Opening Testimony and is incorporated by reference in this Declaration.

3. I prepared the attached supplemental rebuttal testimony relating to Biological Resources for the Petition for Amendment for the Palen Solar Electric Generating System (California Energy Commission Docket Number 09-AFC-07C).

4. It is my professional opinion that the attached prepared testimony is valid and accurate with respect to issues that it addresses.

5. I am personally familiar with the facts and conclusions related in the attached prepared testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury, under the laws of the State of California, that the foregoing is true and correct to the best of my knowledge and that this declaration was executed on __15 July___________ 2014.

Ken Levenstein

PALEN SOLAR ELECTRIC GENERATING SYSTEM
BIOLOGICAL RESOURCES
SUPPLEMENTAL REBUTTAL TESTIMONY
AVIAN IMPACTS AND MITIGATION

I. Names:

Wally P. Erickson
Dr. Ken Levenstein

II. Purpose:

Our rebuttal testimony addresses the issues raised by Staff and CBD regarding the potential impacts, mitigation and adaptive management techniques for Biological Resources – Avian, associated with the construction and operation of the Palen Solar Electric Generating System (PSEGS) (09-AFC-7C).

III. Qualifications:

Our Qualifications are summarized with our resumes in our written testimony previously filed in this proceeding.

IV. Opinion and Conclusions:

AVIAN IMPACTS

Assessment of PSEGS Survey Data Collected through Fall 2013

Despite staff's general approval of preconstruction studies, they assert that one season (Fall 2013) of studies is insufficient to draw any conclusions.

Dr. Smallwood suggests avian behavior studies be done at the PSEGS site in advance of project approval. He goes on to claim that the studies to date are insufficient and not readily interpretable. His contention is that species level flight path and behavior data needs to be collected for every species present in order to properly model potential risks to avian species associated with the project.

REBUTTAL

Staff expressed concern over rare and sensitive (state and federally listed) species seen in the area, including Swainson's hawk, bank swallow, willow flycatcher, Gila woodpecker, six federal priority shorebirds, golden eagle, and peregrine falcon. The expectation is that most of these species are at risk from concentrated flux exposure; in particular, swift and swallow species are identified. Similarly, Dr. Smallwood calls for avian behavior studies in advance of approval, to characterize flight paths and behaviors of resident and migrant species. We do not dispute the potential for some rare or sensitive species to be at risk from exposure to highly concentrated levels of flux around the towers. We have made a significant effort to quantitatively assess this risk with the risk assessment model provided in opening testimony, which analyzes risk to various species groups (e.g., swifts, falcons, doves/pigeons) (Exhibit 1139, Draft BBCS.). At this time, we do not have sufficient data to model expected risk for every species potentially observable at the site – this is particularly true for rare species, like those identified by staff above. As more data become available, we will likely be able to expand the risk assessment model to better anticipate risk at a species level.

Staff expressed concern over conclusions drawn from radar surveys at the PSEGS site. In its Opening Testimony Staff stated, "Although only one season of surveys was conducted the report concluded that the PSEGS area is located in an area of low nocturnal migration use (TN 202000 page I of Executive Summary). Staff is uncertain how this conclusion is supported by a sample of one migratory period in an area known to support migratory birds…" We contend that the results of the late Summer through Fall nocturnal radar study clearly indicate that the nocturnal avian migration through the radar study area was low relative to other areas in California where nocturnal radar studies have been conducted during the Fall season. For example, during Fall 2012, passage rates (targets/km/hr) recorded at the proposed Rio Mesa Solar Project (264 targets/km/hr; Levenstein et al. 2012). were more than twice those recorded at the PSEGS study area (126 targets/km/hr) during the Fall 2013 study. Results presented were for the Fall migration period in particular; a Spring migration study was conducted (April – June 2014), and the results will be available in August.

Staff then writes: "Additionally, the Petitioner's radar data indicate an abundance of insects based on the fact that on 13 nights, insects "cluttered" or obfuscated the results such that data could not be accurately collected."

We are unsure how Staff arrived at the number 13. This is incorrect and must be corrected for the record. WEST conducted multiple radar sessions on each night the nocturnal migration surveys were conducted. Each session was 10 minutes long. During the Fall 2013 radar study, there were 2,306 sessions conducted over the course of 50 evenings. In only four of those sessions (on 2 separate nights, as opposed to the 13 nights reported by Staff) insect clutter was above a certain threshold. This threshold is a conservatively established level of clutter, above which the ability to correctly interpret other targets on the radar screen may become compromised. This occurrence does not necessarily indicate an "abundance of insects." For comparison, during the Fall 2012 nocturnal radar migration study conducted at the proposed Rio Mesa Solar Project, there were 164 sessions during which insect clutter was above the minimum threshold (Levenstein et al. 2012). That is 41 times the number of obscured sessions at PSEGS. Further, insect abundances recorded at night likely do not correlate with abundances that would be detected during the day as cohorts of nocturnal and diurnal insects are largely different.

Dr. Smallwood also takes particular issue with the Fall 2013 bird use data collected at the PSEGS site. He states "Levenstein et al. made no attempt to account for the influence of bird size or distance from the observer when comparing detection rates or percent composition, so the reported results cannot be interpreted accurately." He goes on to comment, “Levenstein et al. (2014) provided a seasonal analysis, which seemed absurd because the surveys only covered one season. Nothing could be said of bird activity over winter, spring, or summer.” Dr. Smallwood concludes, “… Levenstein et al. (2014) failed to achieve any of their stated objectives. They made no fatality predictions (obj. 1). They made no recommendations on project planning or design to minimize bird fatalities (obj. 2). They offered no recommendations on mitigation measures or on further studies (obj. 3).” Finally, Dr. Smallwood critiques the lack of standard errors and confidence intervals presented for bird use estimates.

We believe Dr. Smallwood’s criticism fundamentally mischaracterizes the Fall 2013 bird use data. His assertion that bird size and distance from observer were not accounted for is incorrect. Bird Use Count (BUC) surveys were performed to focus on large birds such as raptors, vultures, and water birds. While all birds observed during these surveys were recorded, only those birds observed within 800m of the observer were included in standardized use rates. In contrast, Small Bird Count (SBC) surveys were conducted to record use by small birds such as passerines, swifts and hummingbirds, doves, pigeons, etc. Although all birds observed were recorded, only those seen within 100m of the observer were included in standardized use calculations. Thus, each survey is designed with a particular objective in mind (in this case, large bird versus small bird use); furthermore, each survey type provides a standardized measure of bird use which can be compared within different areas of the PSEGS site, or between different sites utilizing the same survey design. We do agree that measures of variation (standard errors, confidence intervals) could have been provided.

The criticisms of seasonal analysis are a result of further misinterpretation of the Fall 2013 report. Levenstein et al 2014 was a study conducted during late summer through fall and the seasonal analysis was just that: an analysis of the results of this late summer through fall study; hence, Dr. Smallwood is misinterpreting the intent of the study. Furthermore, avian use data for other seasons is available in reports issued by other biological consultants as summarized in Exhibit 1157. See also Exhibits, 1014, 1035, 1037 and 1048.

The statement that the Levenstein et al. (2014) report failed to achieve its stated objectives is misleading. Dr. Smallwood has reinterpreted and rewritten the objectives of the report in a way which obfuscates their intent. On the contrary, the study met all three of its objectives which were actually “to: 1) provide site-specific fall bird resource and use data that would be useful in evaluating potential impacts from the proposed concentrated solar energy facility; 2) provide information that could be used in project planning and design of the facility to minimize impacts to birds, and 3) recommend further studies or potential mitigation measures, if warranted.” The results of the study (along with the Spring 2009, Spring 2013, and Summer 2013 studies) were used to inform the drafting of a Project Bird and Bat Conservation Strategy (Exhibit 1039, BBCS), where each of the objectives of the Fall 2013 study were specifically and extensively addressed.

Assessment of PSEGS Site: Topography, Habitat, and Avian Migration Patterns

In its Opening Testimony, staff assert that the PSEGS site supports unique habitats. In particular, staff point out five habitat types that are considered rare natural communities by CDFW and are also NECO-designated sensitive communities. They go on to suggest that the area around PSEGS supports broad front migration patterns; but, the region also possess topographical features which may serve to funnel more migrants towards PSEGS.

REBUTTAL

Despite the fact that <15.0% of the Project is covered by habitat types that are considered rare natural communities, three of the five habitat types cited by Staff (i.e., active desert dunes, desert sink scrub, dry lake bed [playa]) occur nowhere within the Project boundary. Furthermore, in surveys conducted in these habitat types within a 1-mile buffer of the Project boundary, these areas exhibited low use by birds. Of the five habitat types cited by Staff, the habitat type that is used by birds to an extent greater than would be expected by chance—Desert Dry Wash Woodland—occurs on only 5.1% of the Project. Approximately 85% of the project site is covered by the Sonoran Creosote Bush Scrub habitat type, which is known to be "more common" and species depauperate. In fact, desert scrub habitat is singled out by Staff as exhibiting particularly low use by breeding and wintering birds (Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others). Thus, the Project is proposed to be built almost entirely within the habitat type (Desert Creosote Bush Scrub) predicted to be least impactful to birds. Further, the loss of any Desert Dry Wash Woodland will be mitigated for by protecting in perpetuity, Desert Dry Wash Woodland habitat outside the Project boundary at a rate of 3 acres protected to every 1 acre disturbed by Project construction and operation.

To address testimony related to the funneling of migratory birds to the Palen site, we acknowledge that landscape features (mountains and valleys) surrounding the site have the potential to influence bird migration through the area, but there are many landscape features throughout a larger area in which the Project is situated that would serve to divert migrating birds around, rather than towards or through, the Project site. The Salton Sea, known to be a high use area for migrating birds is located approximately 35 miles to the southwest at its closest point. Between the Salton Sea and the Project site, there are two mountain ranges, each running northwest-southeast and reaching heights of approximately 3,600 feet (1,097 meters). The Colorado River, which serves as a distinct migratory corridor, is located approximately 36 miles to the southeast at its closest point to the Project.

Assessment of Risk Based on Currently Available Fatality Data from Solar Facilities

The staff reviewed raw data from ISEGS, collected from March to May of 2014. They concluded data need to be corrected for scavenger removal, searcher efficiency, and the possibility for off-site mortality (e.g. birds that are injured yet able to fly off the site and perish). Data also need to be adjusted for search effort among the heliostats (20%) and seasonal variation. There was particular concern over offsite mortality attributed to birds injured from flux and able to glide outside of the facility. It was suggested that birds may experience hyperthermia, retinal damage, or substantial feather damage leading to eventual mortality. Furthermore, staff raise concerns about the location and intensity of flux at ISEGS, particularly in light of data which alleges the facility was running at less than 20% generation capacity from January to March 2014. Ultimately, staff assert that, “The data (collected at DSFF, GSEP, and ISEGS) cannot be used to conclude PV, solar trough, and power tower technologies pose the same risk to birds”. Staff recognizes that data are currently poor from all types of facilities; however, they suggest that the proposed project compounds risk with the presence of flux and 750ft tall towers. They suggest that these conditions may result in a mass mortality event during migration seasons.

Staff testimony asserts that data collected from ISEGS will eventually prove useful in efforts to assess risk at PSEGS; however, they temper this point with three perceived differences between ISEGS and PSEGS. These differences are:

1. PSEGS is located in an area known to support thousands of migrating birds, including large numbers of turkey vultures and Swainson’s hawks.

2. PSEGS is located in an area where topographical features support migration and is close to important bird areas such as the Salton Sea and Colorado River.

3. PSEGS is substantially larger than ISEGS.

Dr. Smallwood (on behalf of CBD) used data from the McCrary study of Solar One (1986), and an assortment of assumptions when data were too limited or nonexistent, to develop an adjusted per megawatt fatality estimate, using an estimator derived by Dr. Smallwood. In the McCrary study, bird use counts were conducted and the entire facility was surveyed for fatalities once per week for 40 weeks. Limited scavenger removal trials were conducted and no searcher efficiency bias trials were conducted, under the assumption that all available bird fatalities would be found due to clear ground conditions.

Based on the limited data reported in the McCrary study, Dr. Smallwood predicts the Solar One fatality rate was 8.76 birds/MW/year, with an 80% confidence interval of 6.96 – 10.55birds/MW/year. Dr. Smallwood then recalculates adjusted fatality estimates using national averages (collected via studies at wind facilities) of searcher efficiency = 0.676 and carcass persistence to the next search (he assumes 9 day interval) = 0.48. Under the assumption of these national rates, Dr. Smallwood calculates 21.57 birds / MW / Year (80% CI of 7.15 to 36.0) at Solar One. This is extrapolated out to 500MW, yielding an expected fatality rate at PSEGS of 10,787 birds per year (80% CI of 3,573 to 18,000).

Dr. Smallwood also turns his attention to the data available from ISEGS and attempts to make predictions of fatality rates at that facility. Based on 70 incidental fatalities recorded in accordance with the special purpose utility permit (SPUT) for ISEGS, Dr. Smallwood asserts that, “fatality rates were very high”. He goes on to quantify this rate using the same method applied to PSEGS, extrapolating the Solar One data to estimate mortality at ISEGS. He predicts 7,981 fatalities per year, with an 80% confidence interval of 2,646 - 13,320.

Following the extrapolation from Solar One to ISEGS, Dr. Smallwood isolates the fatality data found in the April and May MCR reports for ISEGS for further extrapolation. Dr. Smallwood states that the proportion of carcasses available and detected at ISEGS “would be no greater than 20%”. The 183 fatalities discovered in April and May are extrapolated based on this assumed detection probability, along with 20% search area adjustment to yield 2,365 fatalities per month; this is, again, extrapolated to 28,380 birds per year for the ISEGS facility.

REBUTTAL

Estimates Based on Three Solar Facilities

We agree with staff that raw data collected from ISEGS, DSSF, GSEP are not appropriate for extrapolation to yearly avian fatality rates. Any comparison between the fatality data at these facilities would need to be standardized for searcher efficiency and scavenger removal bias, as well as the search effort with respect to area surveyed and frequency of survey. We acknowledge that all of the data available from DSSF and GSEP is incidental, and the data from ISEGS was incidental, in part or in whole, before October 2013.[1] However, the Ivanpah Avian & Bat Monitoring 2013-2014 Winter Report (Exhibit 1174) has been released since our Opening Supplemental testimony was filed. This report details standardized survey efforts between 29 October 2013 and 21 March 2014, as well as results of initial searcher efficiency and scavenger removal trials. Later in this testimony, we will use these data to make more informed estimates of avian fatality rates at Ivanpah, which will provide a much better estimate of potential avian fatality rates at PSEGS than extrapolations based on the McCrary report.

Comparisons between PSEGS and ISEGS are Reasonable

We do not agree with the three major reasons, provided by staff, why the ISEGS site is not comparable to the PSEGS site for the purposes of assessing avian risk.

1. “*PSEGS is located in an area known to support thousands of migrating birds, including large numbers of turkey vultures and Swainson’s hawks.”* This comparison with ISEGS is not only improper, it is, unfortunately, impossible to make because there is no preconstruction data for ISEGS with which to contrast what is being observed at the PSEGS site, or to compare to fatality observations at ISEGS to date. Therefore, it cannot be said with any degree of certainty that ISEGS is not comparable to PSEGS.

2. *"PSEGS is located in an area where topographical features support migration and is close to important bird areas such as the Salton Sea and Colorado River."* As stated above, while landscape features (mountains and valleys) surrounding the site have the potential to influence bird migration through the area, there are many landscape features throughout a larger area in which the Project is situated that would serve to divert migrating birds around the Project. The Salton Sea is located approximately 35 miles to the southwest at its closest point and on the other side of two mountain ranges, each running northwest-southeast and reaching heights of approximately 3,600 feet (1,097 meters). The Colorado River, which serves as a distinct migratory corridor, is located approximately 36 miles to the southeast at its closest point to the Project. Because baseline surveys were never conducted for ISEGS it is not possible to make a determination regarding avian migration through that project and its vicinity. There are as many features around ISEGS that could be interpreted to funnel migrants through that site as there are features around PSEGS that could be interpreted in the same way. And, as is the case with PSEGS, there are also a series of topographical features surrounding the larger ISEGS area that could serve to funnel migrants around the project. Neither Staff nor CBD has submitted evidence that indicates the Palen site has more avian migrants passing over it than the ISEGS site did before that project was constructed. Without pre-construction baseline surveys from ISEGS, it is impossible to make this comparison.

3. "*PSEGS is substantially larger than ISEGS."* On the contrary, based on a project comparison table (Exhibit 1155), ISEGS and PSEGS (as planned) will be almost exactly the same size in terms of acreage; however, PSEGS will have only two towers versus three towers at ISEGS.

For these reasons, and the fact that ISEGS is the only operational solar power tower facility in the general region, of roughly similar scale to PSEGS, we believe the ISEGS data is the best, and only appropriate, fatality data available to assess potential risk at the PSEGS site. That said, we reiterate that the data must be appropriately analyzed and incorporate search effort, survey bias due to detection probability and scavenger removal, proper inclusions of incidental discoveries, and proper adjustment for search area.

Little Evidence of Offsite Mortality as Consequence of Highly Concentrated Flux

There is little evidence to support concern over offsite avian mortality resulting from injuries induced by concentrated flux (i.e. hyperthermia, retinal damage, substantial feather damage, etc.). The National Fish and Wildlife Service Forensic Report (Exhibit 3107) found no evidence of ocular damage in the birds they recovered from ISEGS, even carcasses with large amounts of burned or singed feathers. The report also found no evidence of heat related damage to any internal structures of the carcasses. Exhibit 1176 explains that the solar flux does not heat up the air and therefore there is no temperature gradient across the site. This explains the reasons why Exhibit 3107 did not find any evidence of lung damage in the bird carcasses that were examined. We are unaware of any studies that have determined the levels of concentrated flux or duration of exposure necessary to cause debilitating hyperthermia in birds, and that would leave no evidence of this effect internally, post-mortem. We also have insufficient information to evaluate how this proposed mechanism might vary with body size, plumage coloration, and flight behavior. The Forensic Report also references a study (Brown et. al. 1996) showing loss of take-off ability in house sparrows with relatively minimal damage or loss of flight feathers and secondary/tertiary remiges. While that study only looked at one species, it may at least suggest that even minimal damage to feathers (i.e. from flux) would render flight difficult or impossible, decreasing the likelihood that injured birds could end up outside the facility, over 1km from towers.

The evidence emerging from studies at ISEGS lends further support to our argument that offsite mortality is of minimal concern. As described in the May 2014 ISEGS Technical Advisory Committee meeting notes (Exhibit 1175.), the ISEGS Winter Report showed that 85.2% of carcasses with singed or burned feathers were found within the 260m cleared area around a tower. Including all incidental and systematic data reported since November 2011, 94.8% of carcasses with singed or burned feathers were found within 260m of a tower. In considering initiation of off-site carcass surveys, the TAC concluded that the distribution of singed birds indicates a low probability of observing off-site mortality associated with exposure to concentrated flux.

Risk Assessment based on Generation of Flux

Staff alleges that ISEGS was operating at less than 20% of generating capacity during the months of January to March 2014; regardless, the electrical output of the ISEGS facility from January to March 2014 should not be conflated with the presence of concentrated flux around the towers (see Exhibit 1137). While Staff do concede that heliostats may have been left in standby position during much of this time, implying flux may have been present despite low operational efficiency, the Petitioner believes it is important to provide additional insight. In fact, throughout February, March, April and May 2014, the heliostat fields at ISEGS were producing highly concentrated solar flux during 85% of the daylight hours. The concentrated solar flux was produced by heliostats in tracking position, standby position, and during calibration. Further, the amount of time that the solar fields create solar flux should not and cannot be equated to the electricity production at any one time, especially during these early months of facility operation. In summation, the persistence of highly concentrated solar flux produced at ISEGS throughout early 2014*, is* similar to that which would be produced during normal operations of the facility.

In the face of uncertainty over the fatality data available from ISEGS, DSSF, and GSEP, there is a contention that the 750' towers at PSEGS will increase risk to birds. Though the risk of birds colliding with the power towers at PSEGS is cited by Staff as a concern, the greatest risk of collision associated with tall structures is typically due to the presence of certain lighting regimes (particularly at night and during inclement weather) and/or guy wires (communication and other towers needing support) or windows (tall buildings) because both are difficult for birds to detect (guy wires) or interpret (windows), particularly at night. The towers at PSEGS will be solid structures constructed of concrete, they will not have guy wires, there will be no windows, and lighting will be minimized and otherwise designed not to attract and/or confuse nocturnally migrating birds. Further, the Project is located in an area where poor visibility due to various weather phenomena is rare.

Regarding the risk to birds proposed by the highly concentrated solar flux zone, it is the belief of the Petitioner that the risk to birds may be lower at PSEGS than it is at ISEGS (at ISEGS, towers are significantly shorter than towers at PSEGS). At PSEGS, the zone of risk due to concentrated flux is significantly higher in altitude, where fewer birds typically fly during the day as recorded during preconstruction studies at PSEGS. However, there is no preconstruction data (and the current survey data is not available yet) for ISEGS with which to compare flight path and use observations.

Fatality Estimates from Solar One with Misrepresented Data

It is true that the 1986 McCrary et al. study of Solar One is still the only available study of a solar power tower facility during an entire year of operations. Despite the fact that the McCrary study takes place at a solar power tower facility, we believe that the data are not appropriate for extrapolation to modern power tower facilities 35 to 50 times larger. Moreover, Dr. Smallwood's approach to estimating fatalities at PSEGS and ISEGS based on the Solar One is not sufficiently documented to reproduce (and, thereby, verify independently), and contains several flaws and unsupported assumptions.

McCrary et al. reported 70 fatalities discovered during 40 weekly visits to Solar One. No bias trials for searcher efficiency were conducted; however, the report remarked that, "searches were facilitated by the lack of vegetation and level ground…" Therefore, the report appears to assume all available carcasses were found (100% searcher efficiency). McCrary et. al. reported 70-90% of carcasses persisting between searches, based on 19 carcass removal trials. Using this data (100% searcher efficiency, 80% average carcass persistence between searches, and 70 fatalities discovered during surveys), Dr. Smallwood estimated an avian fatality rate of 8.76 birds/MW/year with an 80% confidence interval of 6.96 – 10.55 birds/MW/Year. While Dr. Smallwood provides a brief description of the application of his estimator, no details were provided as to how confidence intervals were calculated for this estimate, or any subsequent estimates.

Dr. Smallwood attempts to correct for the imperfect information in the McCrary report by estimating fatality rates using national averages for searcher efficiency and scavenger removal, assuming a nine day search interval; however, this search interval is incorrect. The report states 40 surveys were performed over 40 weeks. Thus, the average search interval should be seven days, not nine. Dr. Smallwood appears to have calculated 9 days via 365 days per year / 40 visits per year = 9.125. This is not supported by the information presented in the McCrary report.

We question the use of Dr. Smallwood's national averages to adjust for searcher efficiency and scavenger removal rates. Both factors can vary greatly due to physical variation in carcasses, ground cover, and local scavenger populations across the country; rates can even vary by season within the same site. Average searcher efficiency recorded in publically available studies at wind facilities across the country range from 38 - 100% and 16 – 87% for large birds and small birds, respectively. Mean scavenger removal time ranged from 2 – 64 days and 1 – 32 days for large and small birds, respectively. Based on bias trial information from seven studies in the region[2], we calculated average searcher efficiency rates of 81.5% and 64.2% (overall average 72.9%) for large birds and small birds, respectively. Similarly, mean carcass removal times of 19.8 and 6.1 days (overall average 13 days) for large birds and small birds, respectively.

Given the range of searcher efficiency and scavenge removal rates measured at seven wind facilities in southern California/Southwest US, the use of national average searcher efficiency = 0.676 and average probability of persistence for nine days = 0.48 (which should be seven days, and thus a greater probability) seems inappropriate. Both national averages have the effect of inflating fatality estimates, compared to regional averages. Furthermore, it is unclear if the national searcher efficiency estimates take into account the probability of a searcher missing a carcass on an initial search and finding it on a subsequent search (assuming a carcass persists through multiple searches). Searcher efficiency estimates based on trials where searchers only have one opportunity to find a carcass result in a positive bias in fatality estimates because they fail to account for the probability of finding carcasses after more than one search attempt. Alternatively, carcasses estimated to be older than one search interval need to be excluded from extrapolation with fatality estimators to provide an unbiased fatality estimate. There is no evidence that Dr. Smallwood has attempted to correct for these sources of bias in his calculations.

Using the methods described above in conjunction with the Solar One fatality data, Dr. Smallwood estimates a fatality rate of 21.57 birds/MW/year (80% CI of 7.15 to 36.0). For the reasons just described, we believe a more accurate calculation would yield a much smaller number.

Problems with Extrapolating Fatality Estimates from Solar One to PSEGS

In an attempt to estimate yearly mortality at PSEGS, Dr. Smallwood then extrapolated his estimate of 21.57 fatalities/MW/year to 500 MW; however, this extrapolation is flawed. There is an implicit assumption that per MW, PSEGS efficiency in converting solar radiation into electricity will be equivalent to that of Solar One. It seems unlikely that the solar power tower technology has failed to improve in efficiency in over 30 years; and a simple calculation demonstrates this point. Solar One produced 0.558 MW per acre of heliostat mirror area. PSEGS is projected to produce approximately 0.626 MW per acre of heliostat mirror area (Table 1). Thus PSEGS is projected to operate with approximately 12% greater efficiency than Solar One, based on heliostat mirror area alone. In other words, there will be approximately 12% less heliostat area per MW

[2] Studies from the following facilities: Alite, CA (2009-2010 [Chatfield et al. 2010]); Alta Wind I, CA (2011-2012 [Chatfield et al. 2012]), Alta Wind II-V, CA (2011-2012 [Chatfield et al. 2012); Dillon, CA (2008-2009 [Chatfield et al. 2009]); Dry Lake I, AZ (2009-2010 [Thompson et al. 2011]); Dry Lake II, AZ (2011-2012 [Thompson and Bay 2012]); and Pine Tree, CA (2009-2010 [BioResource Consultants 2010]).

at PSEGS than there was at Solar One. Less heliostat area per MW equates to less collision risk per MW, which suggests a greater reduction in risk given that later in testimony Dr. Smallwood asserts that 70% of fatalities at solar power tower projects are attributed to collision. Furthermore, risk associated with flux is difficult to compare between PSEGS and Solar One because areas of concentrated flux at Solar One existed approximately 85m above ground level (AGL); at PSEGS, areas of concentrated flux will not even begin until approximately 176m AGL. Given variation in bird flight behavior, the flux created by the two facilities induces different risk profiles. The area of greatest flux risk exposure at PSEGS will exist at a height where bird behavior is generally less pronounced.

To summarize, Dr. Smallwood appears to make several errors in arriving at a full-year estimate of "true" mortalities at Solar One. Then, in attempting to compare Solar One to PSEGS, he compounds the errors by improperly scaling on a MW-by-MW basis. This yields an estimate of annual avian fatalities at PSEGS in Dr. Smallwood's testimony that is unreasonably and mistakenly high.

Table 1. Comparison of MW output to approximate heliostat surface area for Solar One and the proposed PSEGS project

Facility	MW	Number of Heliostats	Area of a Single Heliostat (m^2)	Total Heliostat Surface Area (m^2)	MW Per Heliostat Surface Area Acre
Solar One	10	1,818	40	72,500	0.558
PSEGS	500	170,000	19.02	3,232,941	0.626

Problems with Extrapolating Fatality Estimates from Solar One to ISEGS and Mischaracterization of ISEGS Data

An analysis of data from ISEGS, as well as extrapolation from Solar One fatality rates to ISEGS fatality rates, is also provided in Dr. Smallwood's testimony. For the same reasons outlined above, in addition to the fact that fatality data from standardized searches for ISEGS is now available, we find extrapolation of fatality rates from Solar One to ISEGS inappropriate and unnecessary. With respect to Dr. Smallwood's analysis of actual ISEGS data, we have additional concerns.

On page six of the opening testimony, Dr. Smallwood references the incidental fatalities recorded in accordance with the SPUT permit for ISEGS. He states that the 70 fatalities found incidentally between November 2011 and September 2013 (prior to standardized searches) imply, "fatality rates were very high". This is misleading and unjustified quantitatively given that the finds were incidentally discovered during construction of the project over almost 3 years. Drawing any conclusion from these data alone is inappropriate, as suggested by the Staff testimony.

Dr. Smallwood then switches focus from the incidental data recorded before standardized surveys began to the fatality data found in the ISEGS monthly compliance reports for April and May 2014. He acknowledges that in these two reports it appeared that standardized searches had been done; but, it is unclear why he only looked at data from these two reports, when standardized search fatality data was available as far back as October 2013. Nonetheless, Dr. Smallwood goes on to state that the proportion of carcasses available and detected, "would be no greater than 20%." No justification is provided for this estimate. Dr. Smallwood extrapolates the 183 fatalities discovered in April and May based on the 20% assumed detection probability and a 20% search area adjustment to yield 2,365 fatalities per month, which is in turn extrapolated to 28,380 birds per year. Again, this analysis is largely unsupported by the available facts. There is no support provided for the assumption that only 20% of all birds (large, small, partial carcasses, feather spots, etc.) were available and detected. This number seems to be based primarily on the observation that fatalities included, "many hummingbirds, swallows, and warblers". There is also a critical failure to recognize that not all of the fatalities reported were a result of standardized searches, and should therefore not be adjusted for searcher efficiency and scavenger removal.

An even more significant error occurs when all fatalities are extrapolated based on the 20% search area in the heliostats; in fact, arc shaped search plots in the heliostat fields make up approximately 24.1% of heliostat field area. Furthermore, the extrapolation is in error because at least 50% (according to the Ivanpah Winter report) of the fatalities were found in the tower area, which was searched 100% out to a distance of 260m from each tower. When we incorporate the available spring data, the proportion of fatalities in the tower area appears to be upwards of 70-80%. Therefore, in any extrapolation of this kind, only 20-50% of fatalities should be divided by 0.241 to account for the 24.1% search area. Finally, extrapolating fatalities from April and May fatalities alone is inappropriate given that these months overlap with major migration activity, when we would expect higher than average mortality at any facility. One could just as easily make the same extrapolation from almost 3 full months of winter data in the Ivanpah Winter report and come up with a number that is too low because the data represents lower than average fatality rates.

An Improved Estimate of ISEGS Facility Related Fatalities Based on ISEGS Data

In response to Dr. Smallwood's estimated fatality rate at ISEGS, we have derived an estimate based entirely on ISEGS data. We used information on search interval, area search effort, searcher efficiency, and scavenger removal rates from the Winter Report, along with fatality data from October 2013 through May 2014 (data found in MCRs) to provide a rough estimate of fatality rates at the facility. As presented in the Winter Report, we report fatality rates by known cause directly attributed to the facility (concentrated flux effects or collision) and unknown cause (Table 2).

We lacked some of the information needed to execute the exact fatality adjustment procedure performed in the Winter Report, and construct confidence intervals for our estimates. In lieu of this information, we compared the raw fatalities used as input to the fatality estimator (tables 8-16 in the Winter Report) to the adjusted fatality estimates reported in sections 4.2.4 and 4.3.4. We took the average of the ratio $raw\ fatalities/adjusted\ fatalites$, for the tower area, heliostat area, and fenceline areas (taking into account that 144 of 598 plots, or 24.1% of the heliostat area was searched). The result was an average percentage of fatalities available and found equal to 24.8% for the winter season. We note that this adjustment also averages over any differences in detection and scavenging rates for small and large bird carcasses; we were unable to determine from the Winter Report whether bias trials for small and large bird carcasses were ultimately combined or applied separately to fatalities. We anticipate the overall effect of this averaging to be minimal relative to the scale of these estimates.

In accordance with the fatality estimator used in the Winter Report (Huso 2010), fatalities that were estimated to be older than one search interval were excluded from fatality adjustment. For winter data, this meant excluding carcasses likely to be older than 26 days; for spring data this meant excluding carcasses older than a week. These fatalities must be excluded because the Huso model does not explicitly account for the possibility that a searcher has multiple chances to find a carcass that persists on the ground. If these fatalities are not excluded, the estimator will overestimate fatalities.

Treatment of incidental fatality discoveries also calls for careful consideration. Incidental fatalities are those that are found either outside of the temporal window of surveying, or outside of the designated search areas. Typically, only those incidental fatalities which are found on a standard search plot, outside of a regular search, are included in fatality adjustments. For example, a fatality discovered by a maintenance worker on one of the arc plots in the heliostat field would be included in adjusted fatality estimates; however, a fatality discovered on a road which is never searched would not be included in adjusted fatality estimates.

We did not have sufficient information for the spring fatality data obtained through MCRs to determine if incidental fatalities were found on standard search plots. As such, we present a range of estimates, assuming either all or none of the incidental discoveries should be included in adjusted fatality estimates. For the approximately seven month period from 29 October 2013 – 29 May 2014 we estimate between 646 and 857 fatalities attributed to collision or flux. Among those, we estimate between 333 and 524 fatalities attributed specifically to flux. During the same time period we estimate between 764 and 959 fatalities attributed to unknown causes; as discussed in the Winter Report, fatalities attributed to unknown cause precludes flux-related mortality as a possibility. Assuming the fatality rate over these seven months is representative of the remainder of the year, —a reasonable assumption given that this time period includes most of one migration season, and one non-migration season— we estimate between 1,107 and 1,469 fatalities per year directly attributed to the facility; between 571 and 898 fatalities per year are expected to be attributed to highly concentrated flux. Based on the upper range of our facility-related fatality calculations, Dr. Smallwood's extrapolation of 28,380 fatalities per year, based on April and May fatalities alone, is more than 19-times greater than our far more robust estimates. Even when all fatalities of unknown cause and all incidental discoveries are included – 3,113 birds per year— Dr. Smallwood's extrapolation is still more than 9-times greater than our estimate would be. The large discrepancy between his calculations based on poor assumptions, improperly applied methods, and non-representative data, and our estimates based on real data from ISEGS, further highlight the dubious nature of Dr. Smallwood's analysis.

Finally, there is also reason to believe that even our calculations may be overestimating fatalities at ISEGS. More searcher efficiency and scavenger removal trials have been conducted at ISEGS since the conclusion of the Winter Report analysis period. Searchers have also had more time to become familiar with the terrain, typical carcass appearance, and the survey process; it is not unreasonable to expect searcher efficiency will have improved throughout the spring. The Winter Report also mentions experimental trials with search dogs and preliminary results that indicate significant improvements in searcher efficiency; ultimately, they recommend employing search dogs in spring and summer trials. Since our estimates relied on the assumption that winter searcher efficiency would effectively remain constant through the spring, we suspect that adjusted spring fatality rates may actually be lower than we estimated.

Table 2. Estimate adjusted fatalities for ISEGS from 21 October 2013 - 29 May 2014. Adjusted estimates are based on average proportion of fatalities available and found of 0.248.

WINTER			
Survey Type	Collision	Flux Damaged	Facility Related Total
INCIDENTAL			
Tower/Fence	17	33	50
Heliostat Fields	0	28	28
Incidental Total	**17**	**62**	**78**
STANDARD SURVEY			
Tower/Fence (100% coverage)	134	0	134
Heliostat Fields (24.1% coverage)	12	56	68
Standard Survey Total	**146**	**56**	**202**
Winter Total	**162**	**118**	**280**
SPRING			
Survey Type	Collision	Flux Damaged	Facility Related Total
INCIDENTAL			
Tower/Fence	4	129	133
Heliostat Fields	0	0	0
Incidental Total	**4**	**129**	**133**
STANDARD SURVEY			
Tower/Fence (100% coverage)	16	210	226
Heliostat Fields (24.1% coverage)	151	67	218
Standard Survey Total	**167**	**277**	**444**
Spring Total	**171**	**406**	**577**
Total (including no incidental finds)	**313**	**333**	**646**
Total (including all incidental finds)	**333**	**524**	**857**

Assessment of Potential Curtailment and Deterrent Measures

Long and short-term curtailment measures were considered by staff for the purposes of reducing risk to avian species in the event of large scale impacts. Overall, staff requested more information about the operational conditions of power tower facilities, and thus the feasibility of curtailment measures. Short term curtailment options were generally seen as being tied to detection methods, which require testing. Long term curtailment measures were thought to be tied to seasons or periods of high migration, or other conditions (i.e. climatic) that might endanger large numbers of birds over a longer period of time. Dr. Smallwood opined that curtailment was unlikely to be effective since, in his estimation, only 30% of fatalities would be attributed to highly concentrated flux.

Both staff and Dr. Smallwood expressed skepticism over the effectiveness of deterrents at PSEGS. Both parties pointed out potential weakness of deterrents, and unintended consequences. Staff was primarily concerned with the potential effectiveness of any deterrent over the large area of the facility. Dr. Smallwood's primary objections seemed centered on deterrents having the opposite effect and in fact inducing additional mortality.

REBUTTAL

Answers to the questions posed by Staff in its Opening Testimony regarding curtailment options are provided in Exhibit 1178. For the reasons outlined in Exhibits 1136 and 1178, the operational constraints associated with curtailment are not feasible. Perhaps more compelling, the data collected at ISEGS does not support the need for curtailment. The most recent TAC meeting notes (Exhibit 1175) show that the TAC committee, after evaluating the available data (including spring fatality data), agreed that there is no support for curtailing operations during peak avian migration periods.

We acknowledge that deterrent methods have yet to be implemented at a solar power tower facility; however, there are reasons to believe that deterrents could be effective at facilities like ISEGS and PSEGS. Bird deterrent methodologies are routinely used in all manner of settings (e.g., airports, agriculture, mine waste ponds, commercial and residential buildings) and are often effective means of excluding or reducing use by birds from an area of risk to humans, the birds themselves, and/or products of human endeavor (fish farms, agriculture, etc.)**.** In particular, we disagree that deterrents must be effective over the 3,000+ acres of the facility. On the contrary, if deterrents are focused on avoiding avian mortality and injury due to concentrated flux, these need only be effective over a relatively limited area, near the top of each tower. See Exhibit 1140 for a description of a deterrent method that has been employed.

MITIGATION OPPORTUNITIES

As the Committee is aware, PSH proposed a mechanism that has been incorporated into Condition of Certification **BIO-16a** that would require upfront creation of a mitigation fund that could be directed and used by the TAC to mitigate for avian mortality that actually occurs at the PSEGS site. The funding was increased from $800,000 to $1.8 Million by Staff. PSH agreed to the increased funding. PSH has worked diligently and found many areas and potential opportunities where funds could be directed to mitigate for avian impacts. As discussed in our previous testimony and throughout the Revised Staff Assessment, it is difficult to predict the exact numbers and suites of species that will ultimately be impacted by PSEGS. While we have made the best prediction possible using guidance for risk assessments provided by the USFWS for wind projects and adapted for application to solar power tower technology, there are inherent uncertainties in any such risk assessment approach. To account for the uncertainties, we have included reasonable yet conservative assumptions and feel strongly that our ultimate avian mortality predictions at PSEGS are the best estimates available.

We have also endeavored to identify specific mitigation programs and activities to guide the TAC in using the mitigation funds to mitigate for the specific suite of species that may be impacted. This approach was selected because it would allow the TAC to make mitigation funding decisions after monitoring has been performed and the actual impacted suite of species are known rather than basing such mitigation on the current reasonable, yet unconfirmed, predictions.

While we have discovered many potential mitigation opportunities, there is very little publicly available data about the actual population number increases than can be attributed to each activity or to each unit of monetary expenditure. In addition, the costs that have been estimated in the table are not absolute but reasonable ballpark values. We do believe that various initiatives by industry, governmental agencies, and environmental organizations will produce data results over time that will become available to help guide the TAC. However, while the publicly available data is not comprehensive, we have provided the following very approximate estimates to help assist the Committee in understanding our confidence that if the TAC spends the mitigation funds wisely, and in consideration of the mitigation effect of the suite of habitat compensation lands that are being provided for all other species, it is possible that the avian impacts from PSEGS can be fully mitigated (Table 3). However, since there remains uncertainty surrounding the exact amount of avian mortality that will occur, and the actual effectiveness of specific programs, PSH acknowledges that there may be avian impacts that are unmitigated. PSH therefore requests a finding of override of this potential uncertainty.

Table 3. Potential mitigation efforts with estimated mitigation values.

Mitigation Action	Birds Saved	Cost Per Item	Number	Cost Allocation	Birds Saved	Types	Birds Saved Per Item Per Year
Cat removal or cats moved indoors	20 birds/cat	$100	3,000	$300,000	60,000	songbirds	20
Window retrofits	3 birds/retrofit/year	$20	15,000	$300,000	45,000	songbirds/small raptors	3
Fence marking	3 birds/marker/year	$30	10,000	$300,000	30,000	all birds	3
Power pole retrofits	1 eagle/9.3 poles	$2,000	150	$300,000	16	eagles and raptors	0.11
Marking communication tower guy lines	3 birds/marker/year	$200	1,500	$300,000	4,500	all birds	3
Marking electrical lines	3 birds/marker/year	$200	1,500	$300,000	4,500	all birds	3
Modifying lights on communication towers	50 birds/year/tower	$5,000	60	$300,000	3,000	songbirds	50

Mortality Thresholds Rebuttal

In Staff's Response to the Petitioners Motion to Reopen Evidentiary Record, staff stated that thresholds or triggers based on the collection of additional data would be valuable but highlighted setting discrete thresholds (i.e., a given number of birds or each species) would be ***extremely difficult and potentially arbitrary*** due to various unknown ecological factors associated with each species. We agree with Staff's position and do not believe setting mortality thresholds now would not be biologically sound. Staff summarized its reasons that setting mortality thresholds would be problematic, which include:

- The populations for many birds are unknown or poorly understood.
- Which population center is the bird from? The loss of a few birds from a robust population center has potentially lower consequences than the removal of a few birds from a small or isolated breeding group.
- The age and sex of the bird. Removing reproductive females from a population may have more deleterious effects than removing juvenile male birds.
- Other threats associated with migratory birds such as loss of habitat, disease at wintering sites, and drought must be accounted for in assessing thresholds.

However, Staff then goes on to suggest just that, setting arbitrary thresholds for various categories e.g., Listed or Proposed Threatened or Endangered Species, State Designated Fully Protected Species, Raptors, Local Resident Species (according to season), etc.

The Petitioner believes strongly that rather than setting thresholds arbitrarily that will remain in effect for the life of the Project, any performance standard should be included in the Project BBCS, and approached using adaptive management as the operative strategy and with input from the TAC. In this way, the Petitioner, in collaboration with the TAC, can ensure that mitigation moves forward in a manner that is tied to the latest information and results coming out of not only PSEGS, but other Projects and relevant research as well. Should the TAC set mortality thresholds, they should only be used to guide the TAC in allocating the mitigation funds of Condition of Certification **BIO-16a** to benefit the correct suites of avian species. Please see Exhibit 1178 for additional reasons outlining Petitioner's approach with performance standards.

BioResource Consultants, Inc. (BRC). 2010. 2009/2010 Annual Report: Bird and Bat Mortality Monitoring, Pine Tree Wind Farm, Kern County, California. To the Los Angeles Department of Water and Power, from AECOM, Irvine, California. Report prepared by BioResource Consultants, Inc., Ojai, California. October 14, 2010.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W. P. Erickson, and K. Bay. 2010. Final Report: Avian and Bat Fatality Study at the Alite Wind-Energy Facility, Kern County, California. Final Report: June 15, 2009 – June 15, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chatfield, A., M. Sonnenberg, and K. Bay. 2012. Avian and Bat Mortality Monitoring at the Alta-Oak Creek Mojave Project, Kern County, California. Final Report for the First Year of Operation March 22, 2011 – June 15, 2012. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 12, 2012.

Thompson, J. and K. Bay. 2012. Post-Construction Fatality Surveys for the Dry Lake II Wind Project: February 2011 – February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 6, 2012.

Thompson, J., D. Solick, and K. Bay. 2011. Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project. Iberdrola Renewables: September 2009 - November 2010. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10, 2011.