

Meeting Summary | December 10-12, 2007

Altamont Scientific Review Committee

Developed by the Center for Collaborative Policy

Reviewed & Final SRC Approval 2/12/2008

Key Outcomes

Next Meeting: Feb. 12-14 in Oakland

The Altamont Scientific Review Committee (SRC) will hold its next in-person meeting February 12-14 in Oakland. This meeting will include a **technical workshop** to provide information to the public.

Field Visit to Identify and Rank Hazardous Wind Turbines(Dec. 10, 2007)

The SRC completed its fieldwork visiting potentially hazardous turbine sites in the Altamont Pass Wind Resource Area (APWRA). During the field visits, the SRC used its combined expertise to view and assess the configuration, operational status, and physical setting of turbines associated with clusters of raptor fatalities as well as those that appeared hazardous from the physical setting. Fatality data included all previous surveys in the APWRA to date and incidental discoveries reported outside of surveys. The SRC will make recommendations on removing hazardous turbines to help achieve the 50% reduction in raptor mortality required under the Settlement Agreement.

The SRC has clarified its fieldwork methodology in a report that is available on the web at [P67 SRC Selection of Dangerous Wind Turbines Report](#).

The SRC agreed to develop siting guidelines for turbines that are to be relocated. The guidance document will assist the companies in determining appropriate (low-hazard) relocation sites for turbines. The SRC would like to work with the companies to identify opportunities to relocate turbines rather than remove them, whenever possible to minimize the effect on power generation.

Mortality Associated with Feathering versus Locked-Down Turbines

The SRC determined that there is insufficient justification to consider the issue of turbine feathering versus locking down as a potential management strategy for turbines that are in non-operating status. There is no way to determine whether the pattern of fatalities between feathering and locked-down turbines is spurious. Only certain types of turbines lock down. Turbine types tend to be clustered in certain locations. So, the effect that might be attributed to locked turbines could potentially be the effect of the location. Turbines that feather cannot be locked down without installing a locking device, and turbines that are locked down cannot be allowed to feather. The SRC did conclude that the pattern of burrowing owl fatalities between turbines that feather and lock-down highlights the importance of conducting a behavioral study to understand factors associated with burrowing owl fatalities at or near wind turbines.

Measuring 50% Reduction in Mortality of Focal Raptor Species

The SRC will continue considering the appropriate methodology for measuring a 50% reduction in mortality of the four focal raptor species during the post-baseline three-year monitoring period.

The SRC expressed concern that the later the wind companies implement mitigation measures, the less likely that sufficiently precise estimates of mortality will be obtained to assess effectiveness of specific measures, and the less likely the 50% reduction goal will be reached.

Action Items & Meeting Follow-Up

Party	Due Date	Action
Monitoring Team (MT)		Develop recommendation for bird counts: either limiting to raptors or continuing to record passerines and songbirds as well
MT		Analyze type of injury (blunt trauma vs. traumatic) feathering versus lockdown in the report
Bartlett	1/04/08	Draft February agenda for 1/04/08 conference call meeting
Alameda County		Pursue possibility and budget to digitize bird abundance data to make data more usable
MT		Visit field to verify status of turbines that the SRC ranked as functional or non-functional
J Burger	For 12/21	Develop first draft of hazardous turbines ranking
S Smallwood	For 12/21	Develop outline of hazardous turbines relocation guidelines
SRC	February	Consider timeline, goals and work plan for method to measure 50% reduction, including abundance data
County, SRC & Companies		Develop vacant and derelict turbine definition / guidelines (After how long should a vacant turbine be deemed derelict and subject to removal requirement?)

Meeting Account

Field Tour Insights: What Makes a Turbine High Risk?

The SRC visited selected turbines in the Altamont Pass Wind Resource Area on November 29-December 1 and December 10 as part of an effort to identify hazardous wind turbines that should be removed. The field visits were part of the SRC effort to assist Alameda County in meeting the Settlement Agreement goal of a 50% reduction in mortality of four focal raptor species.

The SRC viewed more than 500 potentially hazardous turbines at roughly 150 sites. The Monitoring Team selected the sites based on clusters of known raptor fatalities, and the SRC also looked at some sites seen in passing that appeared to have potentially hazardous conditions. During the field visits, the SRC used its combined expertise to

assess the relative potential hazard of selected turbines based on recorded fatality clusters, topographical setting, observable wind patterns, bird behavior, functional status of the turbine/tower, and wind turbine configuration. The SRC field methodology is summarized in a report, P67 SRC Selection of Dangerous Wind Turbines Report. The list of turbines visited is available in a document named P68 Turbine List for SRC Selection of Dangerous Wind Turbines.

SRC members discussed insights gained through the field visit:

- **Wind walls:** (A turbine configuration consisting of parallel rows of wind turbines closely aligned to each other but with alternating tower heights.) Wind walls previously had low recorded mortality, but where some taller turbines have been removed from the wind wall vertical gaps are created. In the absence of a more complete barrier to flight from an intact wind wall, raptors may attempt to fly through these vertical gaps and potentially be at greater risk of collision with adjacent turbines. Removing additional turbines in the vicinity of the vertical gap and creating a larger horizontal gap for birds to fly through may help to reduce collision potential. An alternative would be to fill in the vertical gap and maintain a complete wind wall as per the original design.
- **Dips and saddles:** These are relatively low spots on a ridge where a ravine comes to an apex at the top of the slope. Winds funnel up to the saddle. Red-tailed hawks may be hovering in front of the turbines along the ridge, hit a saddle with the strong wind, and may be blown up into the turbine. Dips, saddles and other similar topographical features may also be within deliberate flight pathways used by raptors, putting them at greater risk as they attempt to negotiate through turbines that are placed within the dip or saddle. The field visit underscored the importance of including topographical features of turbines in the analysis because it plays such a critical role in bird flight behavior.
- **Long turbine rows that prevent crossing:** At some long rows of turbines, clusters of fatalities were apparent, indicating common places where raptors either forage more often or attempt to cross the turbine row. One possible management strategy might be to create a gap in the row for raptors, because raptors have already demonstrated they will fly there. Of key importance is the width of the gap that is created and the associated topographical considerations. The gap should be wide enough to create a safe crossing point that minimizes risk of collision with the newly-created end-row turbines and should incorporate sometimes subtle topographical features such as saddles and shoulders of saddles to accommodate species, such as golden eagle, that may use these features as flight paths.
- **Non-functional turbines:** The configuration of turbines has changed throughout much of the APWRA due to the large number of non-operational bladeless turbines. These turbines are interspersed with operating turbines creating attractive perch locations for raptors and increasing the risk of collision with adjacent operational turbines. This condition may be particularly dangerous where these bladeless turbines are within wind walls, causing birds to be dangerously near to operating turbines. The status of many of the bladeless turbines, whether they are vacant or derelict, is unclear. To reduce the effect of these vacant or derelict towers, turbines should be clustered along complete rows, leaving larger gaps, as

suggested above, in selected locations to provide for safe flight paths, but avoiding small gaps of non-operating turbines or creating attractive perches in otherwise dangerous locations. Turbines should be clustered with no breaks (an example of a configuration with breaks would be the following string: 2 turbines, no turbine, 1 turbine, no turbine). The SRC noted numerous opportunities where turbines could be relocated along a string in order to fill an unsafe gap caused by a bladeless turbine.

- **Flight diverter:** AWI created an end-row flight diverter by capping a derelict tower and cutting away all its appendages. The SRC thought the design might prove effective, and recommended raptor behavior observations be directed to it. AWI proposed that if the design proves effective, it might be worthwhile to paint the flight diverter black and white rather than just black.
- **Eagle flight paths:** Golden eagles don't seem inhibited by wind turbines and seem to have favorite flight paths using winds. Eagles tend to frequent subtle land features, such as the shoulders of hills. One management strategy may be to open a gap for the eagles to fly through these favorite or “highly used” flight paths.

Several SRC members felt removing/relocating hazardous wind turbines viewed during the field visits holds the greatest opportunity for reducing mortality, other than the full winter shutdown. After ranking the turbines, the SRC would like to interact with the wind companies to compare turbine hazard ratings with power output to further balance steps to reduce bird mortality with minimizing loss of wind energy production. As a result of this field visit, the SRC will develop a list of factors to be considered when relocating turbines, particularly because turbine configuration will continue to change.

Public Comments and Questions

Jim Hopper of AES asked that the SRC write its new discoveries in a report or guidelines that wind firms could use for future turbine siting.

Janice Gan of Fish and Game said if wind pattern data are available, it would be very helpful to overlay with clusters on a topographic map as an analytical element.

Joan Stewart of FPLE and AIC said flight path observations would be helpful with siting. Monitoring team members responded that they are getting ready to start looking at flight path observations.

Bill Warren-Hicks of EcoStat said that the SRC is now seeing a relationship between topographic features and fatalities. He asked if they were collecting data to do something more quantitative.

SRC and Monitoring Team members cautioned that there is not a budget for digitizing data or conducting a quantitative digital assessment of the number of birds in the area (abundance counts). Lee Neher's digitized maps may offer some opportunities. The monitoring team is exploring this with the County.

Data Results Conclusion – High Risk Turbines and Field Visit Outcomes

SRC members devoted December 11 to a working session to review each site and turbine visited, number and type of previous fatality census, and associated maps. The SRC will produce a document ranking the hazardous turbines from 2 to 10, with 10 being the most hazardous.

Public Comments and Questions

Joan Stewart of FPLE and AIC asked if the companies would get SRC raw data sheets. SRC members said they will prepare a document with the turbine number and rating. Their documentation sheets will be available; however, SRC members cautioned that they might be of limited use because the SRC used professional judgment and their biological knowledge of how the birds fly in the area to rank the turbines rather than measuring variables.

In response to questions, SRC members said they relied less on the Smallwood and Spiegel (June 2005) tiered classification scheme in the field and more on the landscape and the knowledge of the expert biologists in the group. The pattern of turbines has changed, creating a different situation for raptors. The tier 1, 2, and 3 classifications cover only a very small number of turbines (slightly more than 300 turbines).

Stewart hopes to gain information on the criteria used for this analysis so the companies can take that into consideration when making relocation decisions. She is concerned about having to go through another round of removals. She said she had presented FPLE's criteria for relocation in the request for credit against requirements for removal of tiered turbines. If SRC recommendations are different, she would like to know what they are. The companies will need to move the turbines before the wind season, which will begin March. They will need to know before the February SRC meeting.

SRC members said that for most of the hazardous turbines, comments on the rating sheets describe the reasons for the ratings. The qualitative criteria will be clearer for those turbines ranked 10; the information will be less clear for lower-ranked turbines. The SRC aims to be maximally helpful to the companies. Understanding that turbine configuration in the APWRA has changed and continues to change is important. The SRC is going to try to develop a guidelines document to help companies with relocations.

Follow-Up Required for Hazardous Turbine Rating and Relocation Guidelines:

- SRC and MT to complete computer input of data on 12/12
- Joanna Burger to develop first draft of rating document
- Monitoring Team to spend one day in the field checking SRC documentation on rated derelict or vacant towers.
- Shawn Smallwood will develop an outline for the relocation guidelines, which can be turned into a draft after SRC review at a conference call meeting

High Risk Turbines and Field Visit Outcomes: Managing Vacant or Derelict Turbines

During the field visit, SRC members reported seeing numerous vacant or derelict (i.e. non-functioning) towers. Some of these towers are included in the ratings, as it was unclear if they were temporarily vacant or planned to be removed.

Some suggested that there appeared to be a substantial increase in the number of non-functioning towers. This creates hazardous conditions for raptors by creating narrow and dangerous gaps in strings and attractive perches on towers of non-functional turbines next to functional turbines.

The SRC would like to receive information on vacant and derelict turbines as part of compliance because the information is important for determining hazardous conditions for raptors. SRC members asked for status updates when turbines become vacant, and whether or not they become derelict.

The SRC would also like a definition of when a vacant turbine becomes a derelict turbine. Alameda County could work with the companies to develop a definition.

Mortality Rates of Turbines: Feathering versus Lockdown

As part of her analysis of winter shutdown data, Julie Yee conducted some analyses on the effect of feathered versus locked-down turbines (see M16d, M16e). Data indicate that three target species (golden eagle, red-tailed hawk, and American kestrel) had lower mortality, and burrowing owls had higher mortality at locked-down turbines when compared to feathering turbines. The issue was discussed at the September in-person meeting and the September 24 and October 16 conference call meetings. Most Altamont turbines feather and locking them down would require installing devices, which would increase maintenance costs.

The SRC began the discussion by defining the terminology as follows:

- **Lockdown:** turbine not operating, blades do not move
- **Feathering:** turbine not operating, but blades move slowly

As an example of what she found, Julie Yee referred meeting participants to the estimated change in annual mortality due to a four-month winter shutdown:

Annual Mortality: Four-Month Shutdown

Species	Feather	Lockdown
Golden eagle	-13%	-0.5%
Burrowing owl	-47%	+33%
American kestrel	-28%	-45%
Red-tailed hawk	-7%	-20%

Public Comment and Discussion

Audience members and SRC members made the following points during discussion:

- Many of the turbines that are locked down are tubular towers, with less opportunity for birds to perch. There could be confounding variables in the analysis.
- Turbine siting factors relating to where the two different types of turbines are located could produce a difference in the species affected.
- During the field visit, raptors were seen perching on both feathering and locked-down turbines, indicating there would probably not be a difference in burrowing owl predation.
- Another difference between feathering and locked-down towers is that lattice towers are often shorter than tubular towers so the blades are lower.

SRC Discussion

One SRC member noted that AES turbines are locked-down and in a burrowing owl area. The SRC briefly discussed a study of the area with half the turbines locked down and the other half not locked down. However, Jim Hopper of AES said the turbines are designed so that they have to be locked down, making the study idea impossible.

SRC Agreement on Feathering versus Lockdown

SRC members decided feathering versus lockdown of turbine blades when turbines are not operating is not a potential management strategy. There appears to be no clear pattern in the data and multiple confounding factors. Statistics demonstrate there is a great deal to learn about burrowing owl mortality in the APWRA and underscore the value of conducting a nocturnal behavioral study to understand the factors, including predation, that affect burrowing owl fatalities near turbines.

Public Comment and Discussion

Bill Warren-Hicks of EcoStat asked Julie Yee a number of statistical questions about her winter shutdown Poisson analysis.

Bill Damon of AWI said FPL's graph and observations during the field visits demonstrated that even with a 30 mph wind, the feathering turbine blades move incredibly slow or not at all. The analysis compares different types of turbines. SRC members said they agreed, and that's why the issue is now off the table.

Follow-Up Required

- MT to analyze type of injury (blunt traumatic vs. traumatic) of feathering versus lockdown in the monitoring report.

Measuring 50% Reduction: Trend Analysis and Other Methods

The SRC has been discussing several ways to measure the 50% reduction in raptor mortality called for in the Settlement Agreement (See [P48 SRC Meeting Notes 8/17/07](#)) and is still considering that question. The SRC task is to help the County assess whether a 50% reduction in raptor mortality has been achieved. The SRC has previously agreed that the monitoring program is for three years from November 2006 to

November 2009. The SRC reiterated that it is looking at a 50% reduction over a 3-year period ending in November 2009 as compared to the California Energy Commission, Smallwood and Thelander, 2004 data.

SRC Member Julie Yee explained that the issue is on the agenda today because SRC members want to make it known to the public that because mitigation is being implemented in different steps at different times over the course of the monitoring period, this creates various lengths and definitions of a post-mitigation period that affects the power or precision to be confident that a 50% reduction has been achieved. The later in a monitoring period that a measure is implemented, the less data are available to represent post-mitigation mortality attributable to specific measures.

SRC members agreed that the 50% reduction in comparison to the CEC study figures should be from the beginning to the end of the three-year program, but expressed different perspectives on what to measure. One SRC member would analyze cumulative data over the three-year program. Three other SRC members were concerned that gradual steps implemented over three years, such as 10% the first year, 25% the second year, etc., would not be 50% if averaged over a three-year period. Two members said they may have to look at the last year of the three-year period in addition to a point estimate representing all 3 years depending on when management strategies occur. The five SRC members agreed they might look at all three spans, a three-year period, a two-year period, and a one-year period.

SRC members warned the audience that the later that wind companies implement mitigation, the more the precision of the mortality reduction estimate is compromised.

There were no public comments on the discussion. The facilitator noted that Audubon representatives, who were not in the audience then, have repeatedly expressed that the three-year period is not about an end point, but is about achieving a sustainable 50% reduction.

SRC members agreed to discuss in February defining baseline and bird abundance, factors important in the process of measuring whether 50% has been achieved. Members urged the County to explore digitizing bird abundance data because annual variability in the number of birds present at Altamont can play a significant role in analysis.

Follow-Up Required

- Alameda County to explore outsourcing bird count data for digitizing, as well as hiring Lee Neher to do the job
- Monitoring Team to develop recommendation on bird counts -- either limiting to all raptors or continuing to record passerines and songbirds as well
- SRC in February to consider timeline, goals and work plan for method to measure 50% reduction

Compliance Reporting

The SRC asked Alameda County for the status of the response to the SRC request for power output data. Sandra Rivera said the County is now working through issues with company lawyers. SRC members made the initial request more than one year ago. The SRC reiterated that having power output data would help the SRC make decisions that would reduce raptor mortality while minimizing loss of power generation.

Alameda County presented a summary of the status of APWRA tier 1 and 2 turbines (See P71_ Rivera/Alameda County: APWRA Compliance Report for Tier 1 and 2 Classified Turbines 12/1/07). Sandra Rivera said there are no tier 1 or 2 turbines left among settling party companies, except those that are covered by a credit issued to FPLE in 2007 as part of the settlement agreement.

Winter Shutdown

The SRC had previously recommended and has reiterated its recommendation for a four-month winter shutdown in order to help achieve the required 50% reduction. A full four-month winter shutdown was recommended in part because it is the period when raptor abundance and use of the APWRA is highest and thus the greatest reduction in mortality can potentially be realized. It appears that the companies are implementing a two-month shutdown instead of the recommended four-month shutdown. SRC members expressed concern that the raptors currently using the APWRA could be killed in large numbers on a per-operating turbine basis if the wind turbines are turned back on in the middle of the winter after two months of being shutdown. The SRC observed many raptors in the APWRA during its field tour, and noticed that raptors flew close to turbine blades, and even right through the rotor planes of idle turbines. The SRC observed many raptors perched on towers, turbines, and blades of wind turbines. It appears the winter aggregation of raptors may be habituating to the shutdown turbines and could be more susceptible to collisions with turbines once the turbines are turned back on. A four-month shutdown would lessen this potential problem because there will be many fewer raptors using the APWRA at the end of February, and at least some of them will be moving through the APWRA from the Central Valley and will not have habituated to shutdown turbines. SRC members are concerned that if the turbines are turned back on in the middle of winter, the effectiveness of the winter shutdown could be substantially negated by the number of raptors killed during January.

Prepare for Public Technical Workshop in February and Annual Meeting with Parties

SRC members discussed possible topics for the workshop:

- Monitoring report
- Summary of management strategy recommendations, including what has been taken off the table and why; what is left on the table
- Summary of hazardous turbine evaluation
- Reaching the 50% goal

The meeting with settling parties will be held after the technical workshop. Settling parties are encouraged to attend the workshop to understand the monitoring data.

SRC Meeting Note Final Approval

The SRC approved P48, the summary for the August 17 conference call.

Future Meetings

Conference Calls

- 12/21/07, 8-10 a.m. – Hazardous turbines ranking, monitoring report, relocation guidelines outline
- 12/27/07, 10 a.m.-12 p.m. – Monitoring report, hazardous turbines follow-up
- 1/04/08, 12-2 p.m. – February agenda

In-Person

- February 13-14, 2008 (which has since been extended to Feb 12-14)

February 2008 Tentative Agenda Items

- Annual meeting with settling parties
- Public technical workshop
- Monitoring data
 - Abundance, baseline, method, etc.
 - Timeline & goals
- The 50% goal

Documents Circulated at Meeting

[P67 SRC Selection of Dangerous Wind Turbines Draft Report 12/9/07](#)

[P68 Turbine List \(Partial\) for SRC Selection of Dangerous Wind Turbines 12/7/07](#)

[P43 Smallwood Memo: Opinion of Some SRC Members that the Period over which Post-Management Mortality will be Estimated Remains Undefined \(7/26/07\)](#)

[P44 Smallwood: Effects of Monitoring Duration and Inter-Annual Variability on Precision of Wind-Turbine Causes mortality Estimates in the Altamont Pass Wind Resource Area, California \(7/26/07\)](#)

[P45 Yee Email: Monitoring Period and Using Averages to Measure Reduction \(response to P43 and P44\) \(7/26/07\)](#)

[P48 SRC Meeting Notes 8/17/07](#)

[M16z Guide to M16 Analyses on Shutdown Effect](#)

[M16d Yee analysis of shutdown effect when blades lock \(9/20/07\)](#)

[M16e Yee analysis of shutdown effect when blades feather \(9/20/07\)](#)

[P56 FPLE Rotor Locking Information](#)

[P58 Smallwood Winter Shutdown Effect of Energetech Turbines \(9/14/07\)](#)

[P71_ Rivera/Alameda County: APWRA Compliance Report for Tier 1 and 2 Classified Turbines 12/1/07](#)

SRC Meeting Participants

SRC Members Days 1 & 2

Joanna Burger
Jim Estep
Sue Orloff
Shawn Smallwood
Julie Yee

Staff

Gina Bartlett, Facilitator, Days 1-2
Sandi Rivera, Alameda County, Day 2
Ariel Ambruster, Facilitator Assistant, Day 2

Monitoring Team

Brian Karas, BRC, Days 1-2
Brian Latta, UCSC, Days 1-2

Others

(Meeting Sign-in is Optional)
Charles Burress, SF Chronicle
Renee Culver, FPLE and AIC
Bill Damon, Altamont Winds Inc.
Janice Gan, CDFG
Jim Hopper, AES Wind Generation
John Moorman, enXco
Eli Saddler, Golden Gate Audubon
Joan Stewart, FPLE and AIC
Bill Warren-Hicks, EcoStat

Appendix: List of SRC Agreements developed December 11 & 12

(Compiled from this document)

SRC Agreement on Feathering versus Lockdown

SRC members decided feathering versus lockdown of turbine blades when turbines are not operating is not a potential management strategy. There appears to be no clear pattern in the data and multiple confounding factors. Statistics demonstrate there is a great deal to learn about burrowing owl mortality in the APWRA and underscore the value of conducting a nocturnal behavioral study to understand the factors, including predation, that affect burrowing owl fatalities near turbines.