



Altamont Winds Inc.



Preliminary Draft

BLACK BLADE STUDY PLAN

**Wind Turbine Black Blade Painting to Reduce Avian Collisions
Altamont Pass, California**

Submitted to:
Alameda County Community Development Agency, Planning Department
Attention: Ms. Sandra Rivera, Planner
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Changes to the original Black Blade Study Plan dated August 21, 2007 included in this first revision are shown in blue underlined font.

TABLE OF CONTENTS

BLACK BLADE STUDY PLAN SUMMARY 4

ACRONYMS 7

1. EXECUTIVE SUMMARY 8

2. INTRODUCTION 9

3. BLACK BLADE STUDY PLAN 10

 3.1 Black Blade Technology Theory

 3.2 Black Blade Technology License

 3.3 Study Plan Overview

 3.4 Treated and Control WTs

 3.5 Monitoring

 3.6 Analysis and Reporting

4. CESSATION OF WINTER SEASONAL SHUTDOWNS 13

 4.1 Cessation of Winter Seasonal Shutdowns

 4.2 Marginal Results for Winter Seasonal Shutdowns

5. CLIMATE AND HEALTH BENEFITS OF ALTAMONT PASS WIND POWER 14

6. EXHIBITS 19

 6.1 Photos of Altamont Pass Wind Turbines with Black Blade Technology

 6.2 Informal Field Trials Graph

 6.3 Treated and Control Wind Turbines Table and Maps

 6.4 Winter Seasonal Shutdown Analysis Results

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BLACK BLADE STUDY PLAN SUMMARY (DRAFT)

Black Blade Technology Theory: To formally field test and prove the theory that avian collisions with WT's can be reduced by painting one WT blade solid black, while the two other blades remain solid white, thereby addressing "motion smear" by making the spinning wind turbine rotor appear more visible to birds.



Preliminary Field Results Positive: AWI has been conducting informal field trials of its Black Blade Technology on a limited scale, involving 42 painted WT's for the past two years, resulting in a roughly 50% reduction in raptor collision incidents, including a 25% reduction for Focal Species.

This Black Blade Study Plan involves the study [of 306](#) WT's within AWI's fleet of 920 WT's, summarized as follows:

Treated WT's: 170 WT's, including [20](#) already installed.

Control WT's: [136](#) WT's, [including 3 that are currently installed as Treated WT's and need to be replaced with all-white blade sets.](#)

[These Treated and Control WT sample sizes were recommended by the SRC on September 24, 2007 based on a sample size analysis conducted by the SRC.](#)

[Stratified Random Selection:](#) [The SRC recommended on August 21, 2007 that the Treated and Control WT's be chosen by random selection based on two levels of stratification: length of string and topographical feature. AWI utilized a consultant recommended by the SRC to perform this randomization.](#)

Installation Schedule: WT painting plan: [December 2007](#) through [June 2008 \(or possibly later, depending on seasonal winds\)](#), provided the County/SRC informs AWI of its approval of this Study Plan by [November 30, 2007](#).

Study Duration: 100% of all Treated and Control WT's searched monthly through November 2009 (to coincide with monitoring timeframe under the County Program).

Field Monitoring: Alameda County's APWRA Monitoring Team (proposed).

Reporting: Reports/updates provided by AWI, with County and SRC guidance and review.

Costs: AWI would absorb any reasonable increased (but pre-approved in writing) monitoring costs caused by this Study Plan, as long as all of AWI's 920 WT's are exempted from winter seasonal shutdowns—see more substantiation below.

Winter Seasonal Shutdown Exemption: Exemption of all 920 WT's owned by AWI from winter seasonal shutdowns is required (1) in order to properly evaluate the effect of WT black blade painting on avian collisions with WT's with respect to Treated and Control WT's, [\(2\) to counter the considerable negative climate and health impacts resulting from winter seasonal shutdowns \(see discussion below\), and \(3\)](#) because implementation of this Study Plan would come at a considerable expense to AWI—and AWI will not be able to financially accommodate both Study Plan expenses and continuing lost revenues due to winter seasonal shutdowns. In addition, AWI would be exempted from winter seasonal shutdowns for the period of the Study Plan, plus any extended study period, including at a minimum the November 2009 - February 2010 winter season, if applicable.

Winter Seasonal Shutdowns Show Marginal Results: AWI's analysis of the two winter seasonal shutdown trials conducted thus far show only very marginal and mixed results. An examination of the monthly and north/south data shows varying and mixed results—in some months, more Focal Species incidents occurred at non-operating WT's than at operating WT's, and vice versa—birds are, in fact, colliding with WT's that are not operating.

Climate and Health Benefits: The negative effect of winter seasonal shutdowns (when fully implemented) causes the emission of 1.4 billion pounds of pollutants and the resultant increase of six premature human deaths, 10 heart attacks, 192 asthma attacks, and 1,033 lost work days over 20 years, as well as, numerous other climate and human health impacts.

Overall Best Solution for Our Society: Therefore, considering the total environmental “picture,” our proposed implementation of Black Blade Technology as a potential solution to reducing avian impacts, while allowing winter operation of our WT's to produce clean, renewable power, provides the best overall solution and benefits for our society, based upon what we know today.

Contact Us. For further information about this Study Plan, please contact us, as follows: Mr. Bill Damon, Vice President, Altamont Winds Inc., phone 925.388.0072, e-mail wd@powerworks.com ; or Ms. Julia Sorensen, Project Engineer, Altamont Winds Inc., phone 925.455.7253, e-mail js@powerworks.com.

IMPLEMENTATION SCHEDULE

21 Aug 2007	initial Black Blade Study Plan submitted to County/SRC for approval
21 Sep 2007	anticipated County/SRC approval
24 Sep 2007	SRC sample size recommendation
31 Oct 2007	anticipate SRC approval
30 Nov 2007	anticipate County/BOS approval
Dec 2007 – Jun 2008	remove 147 WT blades, clean, repair, paint, balance, and then reinstall; relocate 3 currently painted blade sets from Control WT sites to new Treated WT sites; actual duration will depend on seasonal wind levels
28 Feb 2009	interim draft progress report for 2008
30 Nov 2009	study concludes
28 Feb 2010	draft final report

ACRONYMS

“**AIC**” means Altamont Infrastructure Company.

“**APWRA**” means Altamont Pass Wind Resource Area.

“**AWI**” means Altamont Winds Inc. and its partners and/or affiliates.

“**Black Blade Technology**” means the definition provided under the Executive Summary, Section 1, first paragraph.

[“**BOS**” means Alameda County’s Board of Supervisors](#)

“**CEC**” means the California Energy Commission.

“**Control WTs**” means the definition provided under the Executive Summary, Section 1.

“**County**” means Alameda County.

“**County Program**” means the definition provided under the Introduction, Section 2, first paragraph.

“**EPA**” means the Environmental Protection Agency.

“**ER**” means emergency room.

“**Focal Species**” means the definition provided under the Introduction, Section 2, last paragraph.

“**Monitoring Team**” means the definition provided under the Executive Summary, Section 1.

“**O&M**” means operations and maintenance.

“**NASA**” means the National Aeronautics and Space Administration.

“**NREL**” means the National Renewable Energy Laboratory.

“**SRC**” means Alameda County’s APWRA Scientific Review Committee.

“**Study Plan**” means the definition provided under the Executive Summary, Section 1, first paragraph.

“**Treated WTs**” means the definition provided under the Executive Summary, Section 1.

“**University**” means the University of Maryland.

“**WRRS**” means Wildlife Response and Reporting System.

“**WT**” means wind turbine(s).

1. EXECUTIVE SUMMARY

The purpose of this wind turbine black blade study plan (“**Study Plan**”) is to formally field test and prove the theory, following scientifically rigorous methodology, that avian collisions with WT blades can be reduced by painting one WT blade solid black, while the two other blades (of the set of three) remain solid white (“**Black Blade Technology**”)—a theory which has shown promise in laboratory experiments and AWI’s informal field trials. AWI has been conducting informal field trials of this theory on a limited scale for the past two years, and a preliminary analysis of these on-going field trials indicates a roughly 50% reduction in recorded raptor collision incidents (including 25% reduction for Focal Species) using the Black Blade Technology compared to WTs with standard, three white blades.

AWI’s affiliate possesses the exclusive rights to use (and sell/license) the Black Blade Technology, including the ability to install such painted blades on WTs in the APWRA, under an exclusive license agreement executed with the University of Maryland, the holder of a U.S. patent covering this technology.

This Black Blade Study Plan involves the study [306](#) WTs within AWI’s fleet of 920 WTs, summarized with three main components, as follows:

(1) The installation of Black Blade Technology on 170 WTs, of which [20](#) are currently installed (“**Treated WTs**”), by AWI, during the time period of [December 2007](#) through [June 2008](#) (however, more time may be required, depending upon our external painting contractor’s productivity [and seasonal wind levels](#)).

(2) The field monitoring (involving carcass searches and relative abundance surveys) of all Treated WTs and [136](#) reference WTs (“**Control WTs**”) until November 2009 (to coincide with monitoring timeframe under the County Program), with data analysis and report preparation. AWI will analyze the data and prepare the interim and final reports, with review and guidance by the SRC. We propose that the necessary monitoring be performed by Alameda County’s APWRA monitoring team (“**Monitoring Team**”), however, AWI could perform this function, if preferred, with review and guidance by the SRC; and

(3) The immediate cessation of winter seasonal shutdowns of all 920 AWI WTs from this point forward for the period of the study, plus any extended study period, including at a minimum until after the November 2009 - February 2010 winter season, and if this study proves fruitful, permanent exemption from winter seasonal shutdowns. In addition, AWI would absorb reasonable (but pre-approved in writing) increased monitoring costs caused specifically by this Study Plan. More specifically, the exemption of all 920 WTs owned by AWI from winter seasonal shutdowns is required (1) in order to properly evaluate the effect of WT black blade painting on avian collisions with WTs with respect to Treated and Control WTs, [\(2\) to counter the considerable negative climate and health impacts resulting from winter seasonal shutdowns \(see below discussion\), and \(3\)](#) because implementation of this Study Plan would come at a considerable expense to AWI—and AWI will not be able to financially accommodate both Study Plan expenses and lost revenues due to winter seasonal shutdowns. Further, AWI’s preliminary analysis of the two winter seasonal shutdown trials conducted thus far show only very marginal and mixed results—winter seasonal shutdowns provide no clear substantial benefits towards reducing avian collisions with WTs (as discussed later herein).

Clean, renewable energy from APWRA wind farms provide significant climate and health benefits (both to humans and birds, as well as, other wildlife) by displacing the need for the generation of electricity from other, polluting, fossil-fueled power sources. The negative effect of winter seasonal shutdowns (when fully implemented) causes the emission of 1.4 billion pounds of pollutants and the resultant increase of 6 premature human deaths and 10 heart attacks over 20 years, as well as, numerous other negative human health and environmental impacts.

Therefore, considering the total environmental “picture,” our proposed implementation of Black Blade Technology as a potential solution to reducing avian impacts, while allowing winter operation of our WTs to produce clean, renewable power, provides the best overall solution and benefits for our society.

Implementation of this Study Plan requires extensive coordination with on-going WT O&M activities and is subject to field removal/reinstallation postponements due to high winds, however, the Study Plan anticipates installation of the painted blades during the time period [December 2007](#) through [June 2008 \(or possibly later, depending on seasonal winds\)](#), provided the County informs AWI of approval of this Study Plan by [November 30, 2007](#); further, if full approval is delayed by the County, full implementation of this Study Plan would likely need to be delayed by one year due to the windy season.

2. INTRODUCTION

AWI hereby submits this Study Plan to Alameda County (the “**County**”) as a proposal to be considered by the SRC, with final approval by the County. The purpose of this Study Plan is to formally field test and prove the theory, following scientifically rigorous methodology, that avian collisions with WTs can be reduced by painting one WT blade solid black, while the two other blades (of the set of three) remain solid white—a theory which has shown promise in laboratory experiments and AWI’s informal field trials. Upon review and approval by the SRC and County, the Study Plan would be implemented within the County’s September 22, 2005 Avian Wildlife Protection Program & Schedule (the “**County Program**”), with AWI implementing the WT blade painting and field installation.

AWI owns and operates four wind projects in the APWRA, consisting of the 50 MW WPP 87 Wind Project, the 30 MW WPP 88 Wind Project, the 10 MW Altamont Wind Project, and the 5 MW WEG Wind Project—collectively, 920 WTs. 900 of these WTs are U.S. Windpower (or Kenetech) KCS56-100 kW models, plus 20 Wind Energy Group (“WEG”) MS-2 WTs, each rated at 250 kW.

All data used as a basis of this Study Plan have been derived from the WRRS. The WRRS data base is a record of all avian incident finds reported to AIC since 1989 by, but not limited to, the County’s Monitoring Team (from monitoring being conducted under the County Program), wind company field maintenance workers, land owners, County agencies, contractors, and individuals doing research sponsored by NREL and the CEC. All analyses performed by AWI with this WRRS data are based on the date of the incident finds, and do not include any adjustments for carcass aging or scavenging rates/searcher efficiencies.

All analyses performed from the WRRS data and used as a basis of this Study Plan only consider the avian raptor species that are the focus of the County Program, including: Golden Eagle, Red-tailed Hawk, American Kestrel, and Burrowing Owl (collectively, the “**Focal Species**”), unless stated otherwise.

3. BLACK BLADE STUDY PLAN

3.1 Black Blade Technology Theory. Like a human, a raptor's perception of spinning WT blades is susceptible to the phenomenon of "motion smear," where the retina is unable to keep up with the velocity of the blades and the image transmitted to its brain loses resolution until it becomes a transparent blur. Motion smear also increases at higher spinning velocities and at closer distances to the blades. If a bird is unable to see WT blades clearly due to motion smear, it may interpret the blade-swept area as a safe place to fly, and it is subsequently at risk of colliding with the blades. For more information about this subject, please reference the following study: *Minimization of Motion Smear: Reducing Avian Collisions with Wind Turbines, Period of Performance: July 12, 1999 - August 31, 2002*, W. Hodos, University of Maryland, August 2003, National Renewable Energy Laboratory (NREL/SR-500-33249).

Based upon laboratory research by the University of Maryland, and historic informal field trials by Kenetech many years ago, specific patterns painted on WT blades may reduce the effect of motion smear. In this Study Plan, the painting pattern of 1-black blade and 2-white blades (or Black Blade Technology; see a photo of this pattern attached as Exhibit 6.1) is expected to provide the retina more time between successive stimulations of the same image (i.e., white blades) and the perceived image may retain resolution at higher velocities and closer distances. Laboratory testing has shown this "anti-motion smear" pattern increases the visibility of model WT blades at distances at which raptors could safely maneuver away from the blades. In addition, the highly reflective characteristics of the black-painted blade induces a "lightning bolt"-like reflection from sunlight during each blade revolution, which may further enhance the visibility of the blades to birds (see a photo of this reflection attached as Exhibit 6.1).

Furthermore, AWI has been conducting informal field trials of the Black Blade Technology on a limited scale for the past two years, and a preliminary analysis performed by AWI of these on-going field trials indicates a roughly 50% reduction in recorded raptor collision incidents (including 25% for Focal Species) using the Black Blade Technology—a graph of these results can be seen in the attached Exhibit 6.2. As of June 30, 2007, only 6 avian events (all Focal Species; 5 Red-tailed Hawks and 1 Burrowing Owl) were recorded for any of the WTs with painted blades during the time periods that the painted blade sets had been installed. A set of 264 WTs were selected from our total fleet of 920 WTs, none being WTs with black painted blades, having a least one recorded raptor event since avian incidence tracking began in 1989, to represent a set of WTs of comparable raptor risk to the set of 46 WTs that have had or did have painted blades as of June 30, 2007. During the analysis period of June 6, 2005 through June 30, 2007, 102 raptor events (and 68 Focal Species events) were recorded for this set of standard, all white-bladed WTs. Factoring in the time period and quantities of WTs, the results are 0.187 raptor events per WT-year for the standard WTs and 0.094 raptor events per WT-year for the black-bladed WTs, equating to a reduction of approximately 50% with the black painted blade sets (and for Focal Species, 0.125 events per WT-year for the standard WTs, 0.094 events per WT-year for the black-bladed WTs, equating to a reduction of approximately 25% for Focal Species events).

3.2 Black Blade Technology License. AWI's affiliate possesses the exclusive rights to use and sell/license the Black Blade Technology, including the ability to install such painted blades on WTs in the APWRA, under an exclusive license agreement executed with the University of Maryland, the holder of U.S. patent 6,623,243 covering this technology.

3.3 Study Plan Overview. This Study Plan involves the study [306](#) WT's within AWI's fleet of 920 WT's, summarized with three main components, as follows:

3.3.1 Treated WT's. The installation and subsequent operation of painted blade sets on 170 AWI WT's, [of which 20 are currently installed](#)—referred to as Treated WT's. Painted blade sets for the Treated WT's will be installed during the time frame of [December 2007](#) through [June 2008](#), however, more time may be required, depending upon our external painting contractor's productivity [and seasonal wind levels](#).

TREATED WT's SUMMARY

[20](#) Treated WT's currently installed in AWI's fleet
[150](#) Treated WT's to be painted by approximately [June 2008](#)
170 TOTAL Treated WT's

3.3.2 Control WT's. [136 WT's with standard blade sets, consisting of 3-white blades for reference, are referred to as Control WT's, of which 3 are currently installed with painted blade sets and must be relocated due to the stratified random selection.](#)

CONTROL WT's SUMMARY

[3](#) [Control WT's currently installed with painted blade sets that must be relocated by approximately June 2008](#)
[133](#) [Remaining Control WT's in AWI's fleet](#)
136 TOTAL Control WT's selected from AWI's fleet

3.3.3 Cessation of Winter Shutdowns. The immediate cessation of winter seasonal shutdowns of 920 AWI WT's from this point forward [is required](#), plus any extended study period, including at a minimum until after the November 2009 - February 2010 winter season, and if this study proves fruitful, permanent exemption from winter seasonal shutdowns [is also required](#), as further explained in Section 4, below.

3.4 Treated and Control WT's. AWI shall install painted blade sets on 170 [AWI WT's](#), of which [20](#) are currently installed, [referred to as the Treated WT's](#). Following installation, AWI shall operate and maintain these Treated WT's according to its standard procedures. The installation process generally consists of the following:

- (1) removal of current operating blades;
- (2) cleaning and necessary repairs to the blades;
- (3) painting of the blades;
- (4) blade set balancing, if required; and
- (5) reinstallation of the blades, at a time of low winds.

This blade painting process requires extensive coordination with on-going WT O&M activities and is subject to field removal/reinstallation postponements due to high winds, however, this Study Plan anticipates installation of the painted blades during the time period [December 2007](#) through [June 2008 \(or possibly later, depending on seasonal winds\)](#), provided the County informs AWI of **[approval of this Study Plan by November 30, 2007](#)**; further, if full approval is delayed by the County, full implementation of this Study Plan would likely need to be delayed by one year due to the windy season.

The specific WTs selected to serve as Treated and Control WTs are listed and mapped in Exhibit 6.3. To minimize monitoring effort, Treated and Control WTs have been selected from within a contained geographical area, which is the southern portion of APWRA. At the recommendation of the SRC, the Treated and Control WTs have been randomly selected as complete strings, to the extent possible, by a two-layered stratified randomization process. The stratification layers are (1) length of WT string (short, medium, or long) and (2) topographical feature, (ridge or valley). Mr. Lee Neher, a consultant recommended by the SRC, performed this stratified randomization.

3.5 Monitoring. We propose that field monitoring of Treated and Control WTs would be performed by the Monitoring Team, in accordance with protocols currently established by the Monitoring Team and the SRC under the County Program, however, AWI could perform this function, if preferred, with review and guidance by the SRC. As background, the currently established protocols generally consist of:

3.5.1 Carcass Searches: 100% of all Treated and Control WTs searched monthly through November 2009 (to coincide with the monitoring timeframe under the County Program). Under this Study Plan, carcass searches at 189 of the WTs are already being conducted.

3.5.2 Relative Abundance Surveys: point-count data from monthly, 10-minute surveys through November 2009 to measure relative abundance of moderate-to-large birds (e.g., raptors, waterfowl). The locations and quantities of survey stations are to be determined. Again, under this Study Plan, relative abundance surveys at 189 of the WTs are already being conducted.

3.5.3 Scavenging Rates and Searcher Efficiency Trials: will not be conducted under this Study Plan, because the results from such trials currently being conducted by the Monitoring Team under the County Program can be used to adjust the data collected under this Study Plan.

3.5.4 Monitoring Costs: AWI would absorb reasonable (but pre-approved in writing) increased monitoring costs caused by this Study Plan, as long as all of AWI's 920 WTs are exempted from winter seasonal shutdowns for the period of the study, plus any extended study period, including at a minimum the November 2009 - February 2010 winter season, and if this study proves fruitful, permanent exemption from winter seasonal shutdowns.

3.6 Analysis and Reporting. With the established field monitoring protocols under the County Program forming the basis of monitoring under this Study Plan, it is anticipated that the Monitoring Team will only need to prepare minor modifications that addresses the specific differences or additions of this Study Plan compared to the current monitoring plan under the County Program.

AWI, with review and guidance by the SRC, will analyze the field monitoring data and prepare and issue interim and final reports, presenting the findings of the data analysis under this Study Plan.

In addition, under the terms of AWI's Black Blade Technology license agreement, (1) any draft reports must be submitted to the University at the same time as they are submitted to any other entity, (2) any final reports must be submitted to the University forty-five (45) days in advance of

final publication, and (3) all such reports must acknowledge and credit the black blade invention of the University.

4. CESSATION OF WINTER SEASONAL SHUTDOWNS

4.1 Cessation of Winter Seasonal Shutdowns. In order to properly evaluate the effect of WT blade painting on avian collisions with WTs, this Study Plan requires that all Treated and Control WTs be immediately exempt from permanent (current or future Tier 1, Tier 2, etc. shutdowns) and winter seasonal shutdowns for the period of the study, plus any extended study period, including at a minimum until after the November 2009 - February 2010 winter season, and if this study proves fruitful, permanent exemption from winter seasonal shutdowns, [consistent with the permanent and seasonal shutdown exemption for the painted blade WTs of settling wind companies approved by the BOS on January 11, 2007 \(reference Section 5.c of Exhibit G-1 for settling companies in connection with the Altamont settlement agreement between Audubon and the settling wind companies\).](#) As discussed below in Section 5, [winter seasonal shutdowns will result in considerable negative climate and health impacts.](#)

Furthermore, the blade painting and installation process necessary for this Study Plan will come at considerable expense to AWI, and AWI will not be able to financially accommodate blade painting expenses, any increased monitoring costs, and lost revenues due to seasonal winter shutdowns. [Overall, it is a much better use of limited financial resources to implement Black Blade Technology as a means to reduce avian collisions than to continue with winter seasonal shutdowns.](#) For these reasons, this Study Plan includes the immediate exemption of all AWI 920 WTs, including those that are not Treated or Control WTs, from any further winter seasonal shutdowns.

In 2006, AWI informed the County that the estimated lost revenues and increased expenses resulting from the County Program would total roughly [\\$180 million over 20 years](#) (\$9 million per year) for all wind power companies in the APWRA, a value now being realized as having been underestimated. AWI's portion of the cost of the County Program is estimated at roughly [\\$30 million to \\$40 million over 20 years](#) (\$1.5 million to \$2 million per year) depending upon the year. [Of these amounts, winter seasonal shutdowns alone result in AWI lost revenues between \\$500,000 and \\$900,000 per season \(depending upon the year\)—further, we have already incurred well over \\$1 million in lost revenues and expenses since this avian program began.](#) [Additionally,](#) in order to sustain this substantial negative impact to our revenues, we have laid-off about 25% of our workforce in the Altamont Pass, as well as, reduced the installation of replacement parts and maintenance on our WTs. It would be impossible for us to both proceed with this proposed Study Plan and continue the winter seasonal shutdowns of our WTs, while retaining a solvent wind power company. However, since the results of the winter seasonal shutdown program are very marginal, as discussed in Section 4.2 below, we believe it would be more productive, and a better use of funds, to replace the winter seasonal shutdowns with this Study Plan, with the expectation that it will have a greater overall impact on reducing avian collisions.

4.2 Marginal Results for Winter Seasonal Shutdowns. As background, two winter seasonal shutdown trials have been conducted: November 2005 through February 2006, and the same months in 2006/2007. Approximately half of all WTs were shut down for two-month periods, first during November and December (the APWRA was divided roughly in half, in north and south areas), and then, the other half of all WTs were shut down during January and February. In the 2005/2006 season, the north WTs were shutdown first, and then the south WTs. Then, this order was reversed during the 2006/2007 season.

AWI's preliminary analysis of the WRRS data for the two winter seasonal shutdowns for its own WT's indicates marginal results in terms of reducing the collisions of Focal Species with WT's, as shown in the charts and a table of results, provided as Exhibit 6.4. On the seasonal average, there were only two fewer Focal Species incidents with non-operating WT's as compared to operating WT's—certainly a very marginal result considering the valuable renewable energy, health benefits, and climate benefits lost due to the shutdown, as discussed in Section 5, below.

In addition, an examination of the monthly and north/south data shows varying and mixed results—in some months, more Focal Species incidents occurred at non-operating WT's than at operating WT's, and vice versa. Furthermore, the north area experienced more Focal Species incidents at non-operating WT's than at operating WT's, while the south area experienced the opposite. This not only demonstrates that there are no clear substantial benefits provided by the winter seasonal shutdowns, but that **birds are, in fact, colliding with WT's that are not operating**. Therefore, our results strongly support AWI's proposal to pursue WT black blade painting under this Study Plan and cease winter seasonal shutdowns, which is expected to provide an overall better solution to avian incidents.

5. CLIMATE AND HEALTH BENEFITS OF ALTAMONT PASS WIND POWER

Wind power generation displaces generation from fossil-fired power plants (such as, coal and natural gas plants), and thus, displaces the resulting emissions and pollution. In 2003 (latest year data is available), power plants in the U.S. emitted 22 million pounds of SO₂, 8.9 million pounds of NO_x, and 4,560 billion pounds of CO₂—pollutants that cause smog and acid rain, plus lung and heart disease, including nearly 24,000 deaths each year, as well as, 38,000 heart attacks each year. Therefore, the increased use of wind power will displace and reduce emissions and pollution, and thus, reduce the number of deaths and injuries caused by fossil-fired power plants.

Human Lives Saved. The Altamont Pass wind farms, totaling 580 MW of clean power, save roughly five premature deaths each year, plus other respiratory illnesses, including chronic bronchitis and asthma attacks, as well as, cardiovascular illness and lung cancer. Further, over the past 20 years, the Altamont wind farms have saved about 98 premature deaths and 164 heart attacks!

As background, gas, oil and/or coal-fired power plants emit the following harmful pollutants:

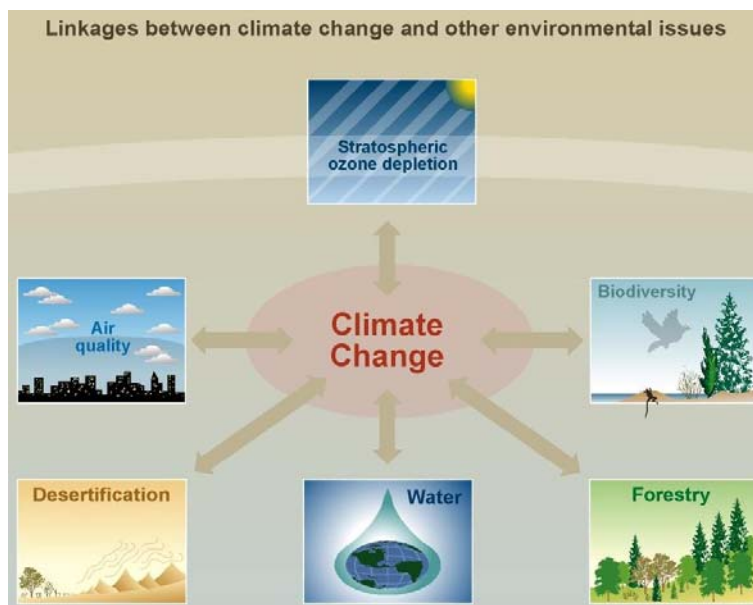
► **Nitrogen Oxides (NO_x)**, which combine with other pollutants to form ground-level ozone, one of the most noxious parts of the smog brew, plus acid rain. Nitrogen dioxide (NO₂) is a deep lung irritant, including lung damage.

► **Sulphur Oxides (SO_x)**, which contributes to the yellow haze over many major cities in the U.S., is a major factor in causing acid-rain damage to our lakes, rivers, and forests. Sulphur dioxide (SO₂) is a reactive, soluble gas that is rapidly absorbed by the respiratory tract, causing lung disease and breathing problems.



► **Particulate Matter (PM)** is a complex mixture of extremely small particles and liquid droplets, composed of many different chemical compounds, including acids, organic chemicals, metals, and dust particles, and also form from other pollutants, such as, NOx, SOx, and acid rain. The larger-diameter PM can be seen as dust, soot or smoke exiting a smoke stack; smaller PM can only be detected using an electron microscope. The smaller PM particles in gases formed/emitted from power plants, pose the greatest health problems because they can lodge deep into your lungs, then move into your bloodstream. Exposure to PM has been associated with a broad range of health effects, including mortality, cancer, asthma and respiratory infections, and cardiovascular problems, such as, heart attacks and heart rhythm (arrhythmias).

► **Carbon Dioxide (CO₂)** causes global warming and climate change, thereby disrupting ecosystems and causing unstable and dangerous weather patterns. 2005 was the hottest year on record globally, according to NASA. The U.S. EPA reports that global warming is expected to raise the temperature in California by 5° over the next century. As the temperature increases, heat-related deaths increase, smog increases, respiratory illness increases, spread of infectious diseases increase, serious droughts increase, certain species go extinct, crop losses increase, subsurface ocean temperatures become warmer, hurricanes become stronger, icecaps and glaciers melt, sea levels rise causing flooding and billions of dollars of damage to beaches and property along the California coasts, California forests decline, and the Sierra Nevada Mountains snowpack is expected to decrease by 30% to 70%, thereby decreasing a primary source of both water and electrical power, all with a warmer, drier climate.



When clean, renewable power generation from the Altamont wind farms displace fossil-fired generation, the annual emissions and pollution savings are estimated as follows:

	coal	natural gas	oil
NOx, lbs/yr	6,200,000	182,000	462,000
SOx, lbs/yr	7,444,000	12,000	620,000
CO ₂ , lbs/yr	2,256,000,000	1,207,000,000	1,602,000,000
PM, lbs/yr	372,000	161,000	350,000
water consumption, gal/yr	553,000,000	282,000,000	485,000,000
fuel saved, annually	153,000 tons	3,760,000,000 cf	663,000 barrels

The emissions and pollution saved during the 20-year life of the Altamont wind farms—over 24 billion pounds of NOx, SOx, PM and CO₂ — would cover the City of Oakland (54 square miles — see photo) about 400 feet deep!



Further, these air pollutants would cause the following estimated human health impacts:

	annually	20 yrs
premature deaths	4.9	98
heart attacks	8.2	164
lung cancer deaths	0.5	10
asthma attacks	160	3,197
asthma ER visits	2.5	51
hospital admissions	3.8	77
chronic bronchitis	4.4	87
lost work days	861	17,200



(However, please note that the values above are based upon complex epidemiological and toxicological studies that provide extrapolations and best estimates of morbidity and mortality, which are effected by differences in population distributions, meteorological patterns, assumed health effects, and other model components.)

Most recently, a study completed in the Los Angeles basin by the University of Southern California in 2006, indicates that deaths and heart attacks caused by Particulate Matter could be two to three times higher than previous estimates. That is, compared to the values above, the Altamont wind farms could be saving upwards of 300 deaths and 500 heart attacks over 20 years.

Therefore, clean, renewable power generation from the Altamont wind farms prevents the health impacts shown above, assuming displacement of gas-fired generation; further, coal-fired generation (which makes up about 29% of the power mix in California [2006 forecast]) has substantially more health impacts compared with gas or oil.

Birds/Wildlife Benefits. Not only does the use of clean, natural wind power save human lives, it also saves the lives of birds and other wildlife. Birds are far more sensitive to pollution than humans due to the thinness of the bird's lung's air-sac gas-exchange tissue, roughly half of the thickness of mammals, plus the large amounts of oxygen required for flight. Therefore, birds are far more sensitive to airborne particulates and pollution—for example, miners use birds in

their coal mines to sense certain gases before it becomes a problem for humans. Birds absorb almost twice as much air pollution in their respiratory system as humans. Therefore, the Altamont Pass wind farms save birds, too, as well as, other wildlife.

Huge Health Savings. Further, the economic burdens placed on society from air pollution created by fossil-fired power generation is huge—the costs to “medicate” and “repair” our society, based upon the various air pollution values above over 20 years, is roughly estimated at \$1 billion, which comprises health care and disease costs, plus damage to crops, property, etc., as well as, impacts to public services. Therefore, the clean, renewable power from Altamont Pass wind farms save our society roughly \$1 billion over 20 years in health and societal costs.

In conclusion, the current winter seasonal shutdown program in Altamont Pass results in roughly a 6% reduction in clean, renewable energy each year (when fully implemented). Therefore, a 6% reduction in clean, renewable energy from Altamont Pass would cause a certain reduction in the human health and climate benefits presented above—for example, a reduction of 6% clean wind energy results in an increase in 6 premature deaths, 10 heart attacks, 192 asthma attacks, and 1,033 lost work days over 20 years; as well as, an increase in 1.4 billion pounds of pollution and emissions over 20 years.

Therefore, we ask you to consider, in the entirety, the negative impacts of continued winter seasonal shutdowns (with very marginal results) versus the overall benefits to our society of clean, renewable wind power from Altamont Pass including renewed operation during the winter seasons, with installation of our Black Blade Technology as a potential solution to reduce avian impacts.

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6. EXHIBITS

- 6.1 Photos of Altamont Pass Wind Turbines with Black Blade Technology
- 6.2 Informal Field Trials Graph
- 6.3 Treated and Control Wind Turbines Table and Maps
- 6.4 Winter Seasonal Shutdown Analysis Results

EXHIBIT 6.1
Photos of Altamont Pass Wind Turbines with Black Blade Technology

Initial field trial wind turbines painted with the Black Blade Technology.



Note "lightning flash" reflection across black blade during each revolution.



EXHIBIT 6.2
Informal Field Trials Graph



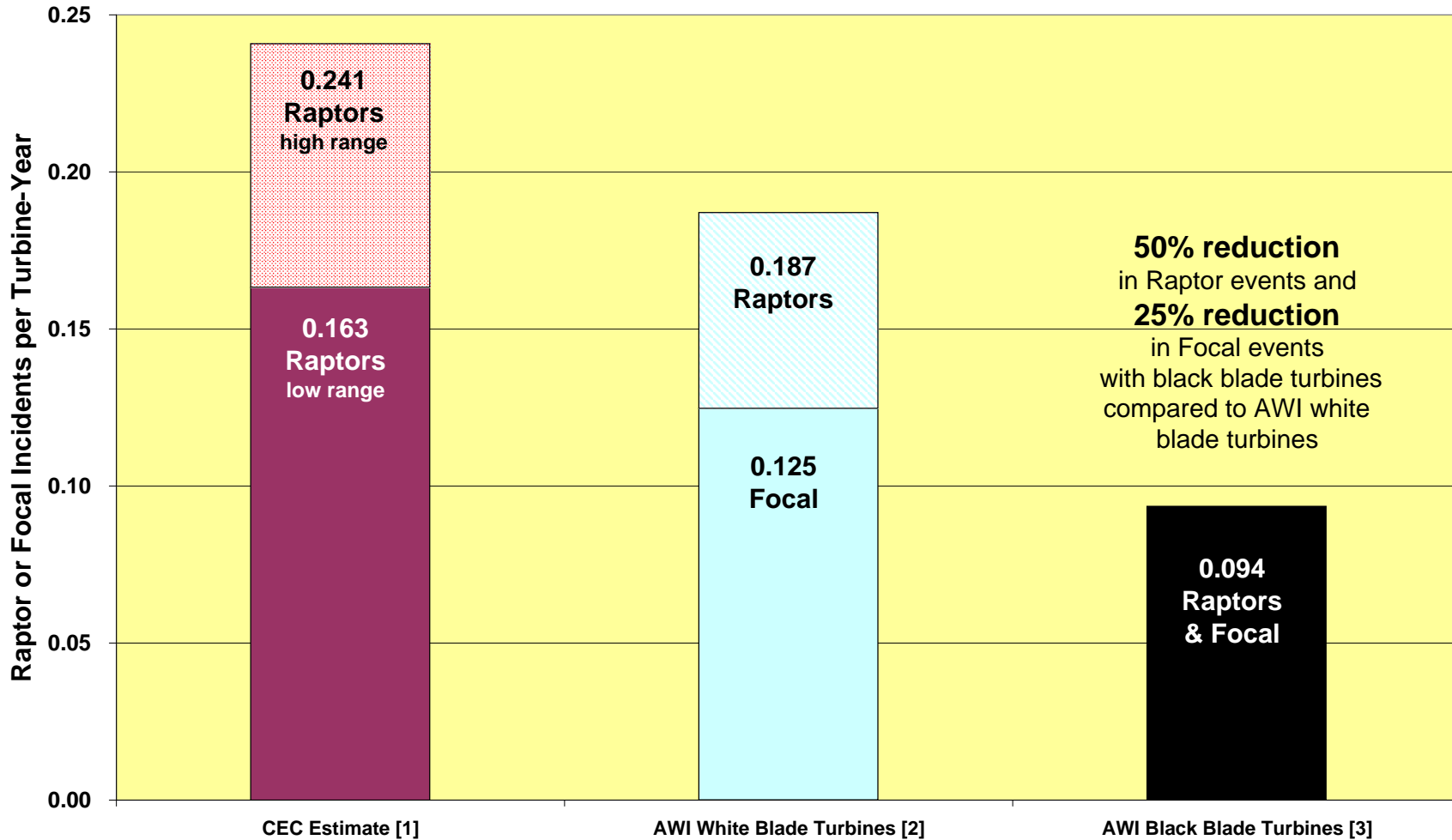
www.powerworks.com

Black Blade Technology Project Preliminary Raptor Fatality Analysis

Altamont Winds Inc., 920 Wind Turbines
Altamont Pass, California

CONFIDENTIAL
Preliminary Draft
For Discussion Purposes Only

30 June 2007



[1] Raptors - Source: "Developing Methods to Reduce Bird Mortality in the Altamont Pass Wind Resource Area," August 2004, BioResource Consultants; funded by California Energy Commission, PIER-EA Contract No. P500-04-052, 1998-2003.

[2] "AWI White Blade Turbines" refers to the AWI turbines that have recorded at least 1 raptor fatality in the WRRS database from 1989 thru 2007 YTD; excludes black blade turbines and turbines vacant due to avian relocations.

[3] "AWI Black Blade Turbines" refers to the 46 towers that have operated with single black blades using the technology patented by the University of Maryland under the exclusive license agreement with Pacific Winds LLC. The majority of the installations occurred in the summer of 2005, some beginning as early as March 2004.

[4] "Focal" means the raptor subset of Golden Eagles, Red-tailed Hawks, American Kestrels, and Burrowing Owls. "Raptors" means all raptor species, including the Focal subset.

EXHIBIT 6.3
Treated and Control Wind Turbines Table and Map

List of Treated and Control Wind Turbines

Altamont Winds Inc., 920 Wind Turbines
Altamont Pass, California

19 October 2007

NOTE: see the following map for WT locations

PROPOSED							
Treated WTs				Control WTs			
South (WT numbers)	Quantity	Monitored	Currently Black Blade?	South (WT numbers)	Quantity	Monitored	Currently Black Blade?
1146-1152	7	7		1154-1157	4	4	1
1158-1159	2	2	2	1331-1334	4	4	
1298-1307	10	10	10	1345-1349	5	5	
1335-1344	10	10		1544-1549	6	6	
1371-1375	5			1551-1562	12	12	
1386-1388	3	3		1582-1595	14	14	1
1397-1400	4	4		5029-5033	5		
1538-1540	3	3		5139-5150	12		
1563-1565	3	3		5155-5180	26	26	
1596-1599	4	4		5186-5190	5	5	
1602-1606	5			5191-5194	4	4	
5073-5083	11	11		5253-5259	7		1
5084-5092	9		1	5324-5335	12		
5093-5095	3			5338-5343	6		
5096	1			5366-5367	2	2	
5181-5185	5	5		5390-5393	4		
5301-5323	23		1	5419-5421	3	3	
5368-5379	12	12	6	WEG1 - WEG5	5	5	
5380-5387	8	8					
5388-5389	2	2					
5394-5404	11						
5405-5418	14						
WEG6 - WEG9	4	4					
WEG10 - WEG16	7	7					
WEG17 - WEG20	4	4					
TOTAL	170	99	20		136	90	3

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EXHIBIT 6.4
Winter Seasonal Shutdown Analysis Results