

**STATE OF VERMONT
PUBLIC SERVICE BOARD**

Docket No. 7250

Amended Petition of Deerfield Wind, LLC for a certificate)
of public good authorizing it to construct and operate 17 turbine,)
34 to 35.7 MW wind generation facility, and associated transmission)
and interconnection facilities, on approximately 80 acres in the)
Green Mountain National Forest, located in Searsburg and)
Readsboro, Vermont, with 7 turbines to be placed on the east side)
of Route 8 on the same ridgeline as the existing GMP Searsburg)
wind facility (Eastern Project Area), and 10 turbines along the)
ridgeline to the west of Route 8 in the northwesterly orientation)
(Western Project Area))

**PREFILED REBUTTAL TESTIMONY OF
STEVEN K. PELLETIER**

ON BEHALF OF DEERFIELD WIND, LLC

July 3, 2008

Summary:

Mr. Pelletier's rebuttal testimony responds to issues related to impacts on birds and bats raised by Scott Darling and Forrest Hammond on behalf of the Agency of Natural Resources, and by lay witnesses.

1 **Q. What is your name, occupation, and business addresses?**

2 Response: Steven K. Pelletier, Principal Biologist at Stantec, at 30 Park Drive in
3 Topsham, Maine 04086. I am also registered as a Certified Wildlife Biologist by The
4 Wildlife Society, as a Professional Wetland Scientist by the Society of Wetland
5 Scientists, and as a Certified Forester by both the Forest Guild and Society of
6 American Foresters.

7
8 **Q. Have you previously prefiled testimony in this case?**

9 Response: Yes
10

11 **Q. What is the purpose of your rebuttal testimony?**

12 Response: My rebuttal testimony responds to issues related to impacts on birds and
13 bats raised by Scott Darling and Forrest Hammond on behalf of the Agency of
14 Natural Resources and by lay witnesses.

15
16 **Birds**

17 **Q. Mr. Hammond states that the Agency of Natural Resources (ANR) is**
18 **concerned by the high number of raptors in the Western Project area relative to the**
19 **Eastern area (Hammond pft at 24). Do you agree that the number was high, and in**
20 **any event, is the number cause for concern?**

21 Response: We acknowledge more raptors were observed at the Western Project area
22 than the Eastern Project area during the 2004 raptor migration surveys but we do
23 not consider those numbers to be high. In addition, the results of the spring 2005

1 raptor migration survey were quite low and show very little difference between sites
2 (44 at the Western Project area and 38 at the Eastern Project area). During the fall
3 2004 survey a total of 725 raptors were observed at the Western Project area and 147
4 were observed at the Eastern Project area for a combined total of 872 raptors.

5 Broad-winged hawks were by far the most common species observed and accounted
6 for 84% of all observations (729 individuals). This species is often observed flying in
7 large numbers in what are called “kettles”, taking advantage of thermal updrafts. In
8 fact, approximately 83% of all observations of broad-winged hawks occurred on one
9 day at the Western Project area when 613 individuals were observed. Therefore, the
10 difference in the total numbers of raptors observed between sites was skewed on one
11 single day when seasonal weather conditions were obviously favorable for broad-
12 winged hawk migration. We strongly suspect similar numbers would have been
13 observed at the Eastern Project area if surveys had been conducted there on that
14 same day. It is important to note these surveys are not designed to fully census the
15 migrating population of raptors, but rather to allow a representative sampling of the
16 migrating population.

17 As shown in both the fall ‘04 and spring ‘05 migration reports, the combined
18 number of raptors observed at both sites each season was low compared to other
19 established hawk watch sites in New England. The closest established hawk watch
20 site is situated approximately 35 miles northeast of the Project site at Putney
21 Mountain, VT. A comparison of the same season results shows far fewer raptors
22 were observed at the Project site even with a similar level of effort between the two
23 sites. A combined total of 872 individuals were observed in fall ’04 during 117

1 observation hours at the Project site while a total of 4,865 individuals were observed
2 during 139 hours at Putney Mountain, VT. This helps clarify why we consider the
3 numbers of raptors observed at the Project site to be low and why we believe the
4 Project is not located in a concentrated hawk flyway.

5 Finally, we emphasize the overall risk of raptor/turbine collision – outside of
6 the 1970's Altamont project in California – has been consistently demonstrated to be
7 extremely low, with a recent study finding of 0.03 raptors per turbine per year (or
8 expressed differently, 0.04 raptors/MW/YR; TWS 2007).

9
10 **Q. Mr. Hammond testifies that because you were unable to analyze the numbers**
11 **of raptors below 125 meters, the risk assessment was incomplete (Hammond pft at**
12 **24). How do you respond to this concern?**

13 Response: The turbine type selected for the Project at the time of the fall '04 survey
14 had a total height of 100 meters (328 feet). It was not that we were unable to analyze
15 the use of airspace by raptors below 125m, we simply designed and conducted our
16 analysis to accommodate the height of the turbines as planned at that time. The
17 proposed turbine height subsequently changed from 100m during the 2004 surveys
18 to 125m (410') in 2005. All raptor flight heights were subsequently analyzed for the
19 new turbine height during 2005 for raptors flying below 125m. Overall, only 9% of
20 raptors observed during spring 2005 were flying less than 125m.

21 We also note that raptor height estimates were based on the ground elevation
22 over which the bird was flying, and not over the ridge elevation. The flight paths of
23 raptors observed at the Project area indicates a majority of raptors were observed

1 flying over the surrounding valleys and side-slopes, and not over the Project area
2 ridgeline (see Figure 2-8 of fall '04 report).

3 Finally, the existing Searsburg facility allowed direct observations of raptor
4 interactions with existing turbines. Although these turbines are not as tall as those
5 proposed for the Deerfield Project, it was apparent that migrating and resident
6 raptors were aware of the presence and movement of the turbine blades as they were
7 repeatedly observed soaring near turbines and lifting up over the spinning turbine
8 blades. We therefore do not believe our assessment of the potential risk of collision
9 to migrating raptors is incomplete.

10

11 **Q. Ms. Linowes claims that the conclusions of the fall '04 raptor study are**
12 **unsubstantiated due to few, non-consecutive days of observation split between two**
13 **sites and that the study should be expanded to more days over multiple years**
14 **(Linowes pft at 2-3). Do you agree?**

15 Response: No, I do not agree. Fall '04 raptor surveys were designed through
16 consultation with the USFS, USFWS, and VANR. Additionally, the level of effort
17 required for studying migrating raptors at the Project site during fall '04 was on the
18 high end of the study effort typically recommended for raptor studies in New
19 England. We do not agree that the study should have occurred over several years
20 because the overall conclusions of risk would most likely be the same, and – as
21 previously noted – a large body of evidence is growing that indicates very low raptor
22 mortality rates at all wind projects across the country.

1 Since different raptor species migrate at different times, surveys were
2 sampled across the full migration window known for raptor species in the Northeast.
3 The rationale for sampling across an extended period was to observe each individual
4 species' peak migration period. We question Ms. Linowes' criticism of the fall '04
5 survey effort (10 days at each survey location for a total of 20 days) as this effort was
6 greater than the spring '05 effort of 6 days at each survey location. We also note the
7 level of effort required to conduct each field study, including raptor surveys, was
8 developed in coordination with USFS, USFWS, and VANR staff in advance of the
9 studies, and that regular correspondence was maintained with agency staff during the
10 course of the studies in the event there was a need to modify various actions.

11
12 **Q. Mr. Hammond states that the Western site showed the highest nightly**
13 **passage rate for migrating birds of any of the 32 sites in the Northeast presented in**
14 **your testimony, and twice the rate of the Project's Eastern site (Hammond pft at 28).**
15 **Is this accurate, and if so, is it relevant to your avian risk assessment?**

16 Response: This statement is not accurate and ignores the fall '04 survey conducted
17 at the Western Project site. Season mean passage rates documented at the Western
18 Project site were 193 targets/km/hour during fall '04 (versus 175 at the Eastern
19 Project site) and 559 targets/km/hour during fall '05. Additionally, passage rates
20 observed at the Western Project area were not twice that of the existing Eastern site.
21 The only season it was close to twice the amount was when Mr. Hammond
22 compares the fall '05 Western site survey with the Spring '06 Eastern Project site
23 survey. This is generally common when comparing fall passage rates to spring

1 passage rates. Fall passage rates are generally higher due to the additive recruitment
2 of that year's young into the migrating population. The mean passage rates observed
3 during the fall 2004 survey at the Western Site were at the low end of the range of all
4 other fall studies. The mean passage rate observed during the fall 2005 was at the
5 high end of the range of other studies but not orders of magnitude different and was
6 not the highest as recorded in Table 3, on page 16 of my prefiled direct testimony.

7

8 **Q. Ms. Linowes argues that your comparisons of radar survey results in 2004 and**
9 **2005 to other parts of the northeast appear arbitrary. She claims that in 2004 you**
10 **explain comparatively low numbers as a result of the northerly location, but in 2005**
11 **cite the much higher totals as evidence that migration is similar to the rest of the**
12 **northeast (Linowes pft at 3-4). How do you respond to these claims?**

13 Response: The comparison of radar data between sites depends on a number of
14 factors and is often not that reliable. For example, one factor and probably the most
15 important factor that can influence comparisons between sites is the amount of
16 visible airspace that is detectable by the radar. If one site has a better view of the
17 surrounding airspace than another, those two sites may not be compared evenly.
18 With these factors set aside, the purpose of the comparisons and the table provided
19 in the reports and pre-file testimony was to show that the results found at the
20 Deerfield Project site were not significantly different than the results found at other
21 sites. The results found at the Project site were shown to occur at the low, middle,
22 and high end of the range of other studies. That said, one can see that variation in
23 passage rates occurs between sites and years, but not by orders of magnitude. The

1 conclusion made in 2004 was expanded in 2005 and even 2006 as more and more
2 radar survey results became publicly available and more was learned about nocturnal
3 migration in the northeast. It is important to note that the study conducted in 2004
4 was one of only a handful of studies using marine radar technology as it was a
5 relatively new method for tracking nocturnally migrating birds.

6

7 **Q. Ms. Linowes states that although most migrating birds flew above the turbine**
8 **heights, fog or low-cloud ceilings can cause birds to drop their elevation, resulting in**
9 **a high potential for collision (Linowes pft at 4). Is this accurate, and if so, does it**
10 **alter your risk assessment?**

11 Response: Yes, Ms. Linowes' comment is accurate concerning bird flight under
12 certain weather conditions, although her conclusion regarding potential mortality is
13 not as clear. Birds may drop in elevation depending on weather conditions,
14 particularly fog or low cloud ceilings. This is one reason that all weather conditions
15 except periods of constant rain were surveyed with the radar. Nights with low cloud
16 ceilings and fog were surveyed because these weather conditions do not influence
17 what the radar can detect. It is only when moisture falls from clouds in the form of
18 rain that the radar cannot detect targets because the radar can detect the rain drops
19 and becomes entirely obstructed by them. However, nights with passing rain events
20 were still surveyed and data was collected on those nights in between rain events. It
21 is important to note that the nights with inclement weather such as fog, low cloud
22 ceiling, or unfavorable wind direction are typically those nights with the lowest
23 passage rates. So it may be true that collision risk is slightly increased for individuals

1 who drop their elevation due to low-cloud or fogging events; however this is also the
2 time period when very few individuals are migrating.

3

4 **Q. Ms. Linowes objects to Woodlot’s use of a 100-meter height for turbines in its**
5 **study, not the 125-meter height cited in John Zimmerman’s prefiled testimony**
6 **(Linowes pft at 5). How do you respond to this claim?**

7 Response: It is unclear what study Ms. Linowes is referring to in this comment. As
8 explained above, a turbine height of 100 meters was used during the fall 2004 season
9 because at the time that was the height of the proposed turbines. The only survey
10 that could not be re-analyzed for the change in turbine height was the fall 2004
11 raptor survey. Since that time, all surveys post 2004 were analyzed using a turbine
12 height of 125 meters. However, all radar surveys including the fall 2004 survey were
13 re-analyzed in 2005 to accommodate the change in turbine height from 100 meters
14 to 125 meters. This information was provided in Table 2 on page 12 of the Prefiled
15 Direct Testimony of Robert Roy and Wally Erickson dated January 8, 2007.

16

17 **Q. Mr. Hammond cites the need for additional information in order to assess the**
18 **risk to avian species: insect data from the radar studies, an acoustical study to**
19 **determine the composition of migrating species, on-site weather data to compare**
20 **with radar passage rates, and further information on the volume of airspace analyzed**
21 **and the effect of local topography on migration channeling (Hammond pft at 29-30).**
22 **How do you respond to these issues?**

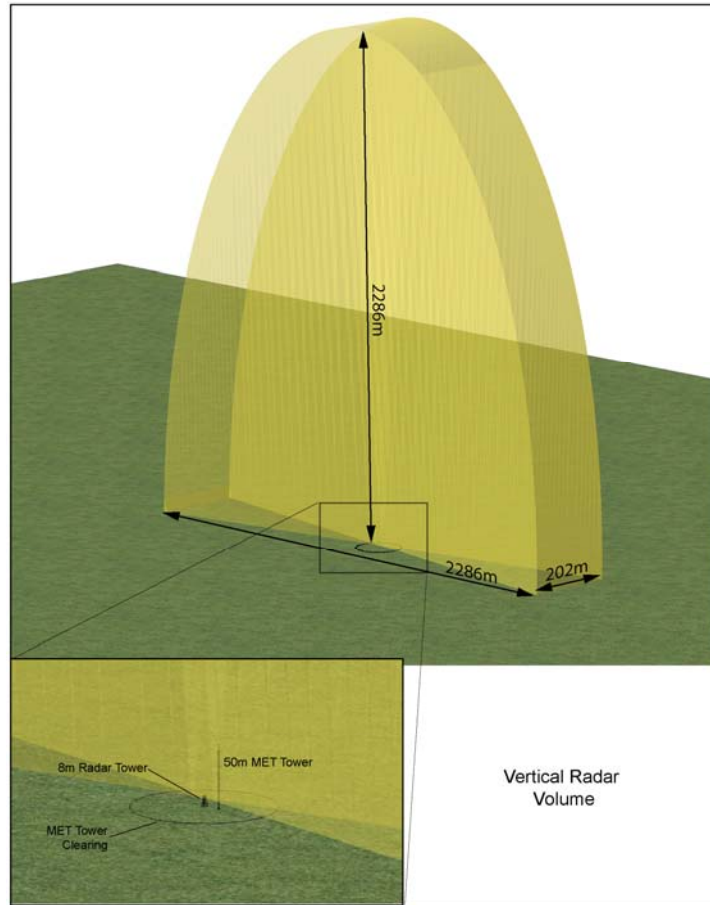
23

1 Response: I am unsure of what additional insect data from radar studies is required
2 to determine risk to avian species – or its relevance. The removal of targets
3 observed moving less than 6 m/s has become the primary means of distinguishing
4 powered flight (i.e., birds and bats) from insects that are more influenced by local
5 wind movements. This is based on known flight speeds and experience with both
6 marine and NEXRAD radar systems. The 6 m/s threshold takes into account the
7 wind speed and direction of each sample analyzed to determine the target's true
8 powered flight speed over the ground. This calculation has been generated over
9 many years of research and is a well recognized standard among all radar surveys. All
10 targets flying faster than 6 m/s are considered a bird or a bat target and anything
11 flying slower is identified as an insect.

12 Acoustic bird studies have been shown to be limited by the range at which
13 they can detect bird calls and the species that they can detect. Since some birds do
14 not emit call notes during migration, they cannot be detected; others may not call
15 during the brief time their flight path crosses over the instrument. Additionally, the
16 range of acoustic bird sensors is limited to approximately 300 m above ground level
17 and covers only a 60 degree cone from the location of the acoustic monitor.
18 Consequently, the volume of air space these acoustic devices can survey is much
19 smaller than the volume of air space monitored with a controlled avian radar system.
20 Conversely, the maximum height of traditional avian radar surveys (i.e., operated at a
21 1.4 km range) is 2286 meters both vertically and horizontally. The vertical range of
22 the radar and volume is depicted below.

23

1



2

3

4

5

6

7

8

9

10

Additionally, it is not possible to accurately measure birds' flight heights above ground level using acoustic monitoring devices. If a bird is detected using acoustic microphones, it can only be determined that the bird is flying somewhere between ground level and the maximum range of the microphone. Inclement weather conditions can also affect the acoustic monitoring devices by causing interference with certain weather or ecological conditions. For example, high wind speeds, periods of rain, insects, and other forms of ambient noise can affect the

1 microphone's ability to detect birds because the surrounding conditions can overload
2 the microphone.

3 On-site weather data was seasonally compared with radar passage rates and
4 flight heights and reported in each of the study documents. Weather data included
5 both local met tower data supplemented by hourly field observations collected
6 during the course of the nightly radar surveys.

7 Concerns about the effects of local topography on migration channeling are
8 again best addressed by reviewing the height above ground level (agl) data presented
9 in Table 1, indicating migration largely occurs well above the elevation of the
10 proposed turbine heights and local terrain, and are further supported by findings
11 recently published by the Committee on Environmental Impacts of Wind Energy
12 Projects (NRC 2007). This high elevation, broad front migration pattern is
13 particularly true on nights of favorable passage. Though these patterns are less
14 apparent on nights of poor weather, passage rates for those nights of poor weather
15 have been found to also be greatly reduced.

16

17 **Q. Ms. Linowes cites three reasons why she believes Woodlot's study is**
18 **incomplete: 1) the radar survey did not include samples from August, 2) the study**
19 **limited the horizontal risk area to a 1 km sample space, and 3) the survey included**
20 **only two seasons (Linowes pft at 5). How do you respond to these claims?**

21 Response: Ms. Linowes is incorrect to state that only two seasons of study were
22 conducted. Radar data was collected over the course of 30 nights at three distinct
23 Project area sites in the fall of '04, 20 nights at the Eastern Project site in spring '05,

1 30 nights at the Western Project area in fall '05, and 30 nights again at the met tower
2 in the Eastern Project area in spring 2006. This series of three seasonal radar studies
3 involving a mix of four distinct locations provides a comprehensive assessment of
4 spring and fall avian migration windows over the Project area. The timing of the
5 individual studies covers the most seasonally sensitive periods of concern, and helps
6 illustrate the relatively high elevation broad front migration that simultaneously
7 occurs over both Project areas. The fact that studies were not conducted in August
8 does not pose a substantive hindrance to the data quality, as the peak periods of
9 migration were adequately covered during each of the seasonal studies.

10 As to her concern over the limited sample space, the physical area sampled
11 by a radar system at a single site is greater than 1 km and is described in the
12 preceding response and figure. As noted, these surveys were conducted at six
13 different locations within the Project area. More importantly, the cumulative data
14 gathered at the various sites collectively supports the reported high elevation, broad-
15 front type of migration observed throughout the larger Project area. These
16 landscape scale observations are further supported by similar data from other
17 publicly available radar studies (See attached Appendix).

18

19 **Q. Ms. Linowes testifies that the predominant bearing of south-bound migrants**
20 **detected in the study lies parallel to the ridgeline and Project layout, increasing the**
21 **risk of collision as birds would encounter multiple turbines in a row (Linowes pft at**
22 **4-5). Is this accurate, and if so, does it alter your risk assessment?**

1 Response: Ms. Linowes' assessment is not accurate. The risk of avian-turbine
2 collision is proportional to the number of individual birds flying through the turbine
3 air space. See comments above. Three seasons of radar surveys, encompassing four
4 sites, consistently demonstrated a broad front migration, all well above the proposed
5 turbine height for the Gamesa G80 (120 m) or G87 (122m). Radar data depicted a
6 seasonal mean (above ground) flight elevation of 624m at the Eastern Project site,
7 624m at the Western Project area, and 611m above the Low site (all during fall '04);
8 523m at the Eastern Project site (spring '05); and 435m at the Western Project area
9 (fall '05). Interestingly, the lowest elevation site (fall '04 Low site) indicates the
10 highest elevation flight, helping demonstrate how most seasonal migration occurs
11 well above the general terrain in a band between 300 to 600m in elevation.

12
13 **Q. Mr. Hammond suggests that Deerfield should conduct detailed post-**
14 **construction bird and bat mortality studies for a minimum of three years in both the**
15 **spring and fall migration periods (Hammond pft at 31-32). How do you respond?**

16 Response: There are at present a number of ongoing post-construction mortality
17 studies currently underway throughout the northeast, central, and mid-coastal US,
18 with an even larger number anticipated to be initiated over the next two years.
19 Properly designed, they represent an expensive annual undertaking, requiring an
20 extensive amount of regular and often tedious field work, including use of scavenger
21 and searcher efficiency trials to account for the possibility of missed mortality.
22 Given the level of effort already underway on a national level, it may be more
23 reasonable to develop an approach that requires a 2-year monitoring window, with

1 an requisite option to include a third year – and possibly use of adaptive
2 management techniques – should problems present themselves during the first 2
3 years. This also allows sufficient time for the wind industry as a whole, along with
4 federal and state agencies, to gather and analyze the collective results of other current
5 and ongoing studies, and to use those data to help avoid and minimize future risk.

6

7 **Q. Mr. Hammond states that any CPG granted to the Project should include the**
8 **ability to make operational adjustments if mortality is found to be excessive**
9 **(Hammond pft at 32). How do you respond to this claim?**

10 Response: I believe it's a reasonable request provided the adjustments are based on
11 sound and ecologically appropriate data. I also believe that ongoing surveys are
12 currently contributing a great deal of relevant data and source information that
13 promote our understanding of seasonal and nightly migration patterns in relation to
14 weather and regional site conditions, and that these data will provide an enhanced
15 means of predicting risk which can then be minimized through contracted
16 operational adjustments.

17

18 **Q. Ms. Linowes claims that “the Deerfield project may pose a very high risk to**
19 **nocturnal migratory birds and bats. Again, at 559 t/km/hr and a mean 13% flying at**
20 **or below 100 meters (again, 100m is too low), Deerfield represents one of the highest**
21 **number of nocturnal migrants flying within the rotor space of the other studies cited**
22 **in the table in Appendix H.” In support of her claim, she cites two letters, one from**
23 **the Virginia Department of Game and Inland Fisheries (“VA DGIF”) to the State**

1 **Corporation Commission and one from biologist Daniel Boone to the Maryland**
2 **Public Service Commission, both of which posit close ties between passage rates and**
3 **projected fatality rates at wind farms (Linowes pft at 5-6). How do you respond to**
4 **these claims?**

5 Response: Without apparent explanation, Ms. Linowes has ignored five of the six
6 Project area studies to make her comparison and only acknowledges the single
7 highest reported rate. In fact, a series of six separate radar surveys were conducted at
8 4 sites over the course of the 4-season Project area study, with seasonal passage rates
9 ranging from 150 t/hr/km at one site in the fall of 2004 to 559 t/hr/km in fall 2005.
10 Passage rates recorded in the fall of 2004 were 175, 193, and 150 t/hr/km (at the
11 Eastern, Western, and Low Elevation sites, respectively), 404 t/hr/km in the spring
12 of 2005, and 263 t/hr/km in the spring of 2006. Please note too the “% *Target Below*
13 *Turbine Height*” figures, ranging from 1 to 11% for each of the six studies (see
14 attached Appendix).

15 Regarding both the VA DGIF and Boone comments, I am not aware of any
16 studies that show a positive correlation between bird passage rates and fatality rates
17 at wind projects. To the contrary, bird fatality rates have been consistently low, and
18 do not seem tied to passage rates.

19

20 **Q. According to Ms. Linowes, the National Wind Coordinating Committee’s**
21 **“Avian Fact Sheet,” which cites average fatality rate of only 2.3 birds per turbine per**
22 **year, is weighted toward wind facilities in the west, while eastern facilities show more**

1 **than double the fatality rate of western sites (Linowes pft at 6-7). Is this accurate,**
2 **and if so, does it alter your risk assessment?**

3 Response: Only a limited number of studies utilizing relatively consistent and similar
4 methodologies have been completed to date. NRC (2007) reports total annual bird
5 fatalities per turbine and per MW are similar for all regions examined in these
6 studies, although data from two mid-Atlantic coastal sites suggested more birds may
7 be at risk on forested ridge tops than in other regions. Conversely, TWS (2007)
8 indicates bird and bat mortality from wind power in other parts of the U.S. is
9 comparatively lower than in California and Appalachia. Consequently it is
10 inappropriate to conclude one continental region is more prone to fatalities than
11 another. Finally, we note that the NWCC expresses specific caution over the use of
12 the Fact Sheet as a reference because the summaries of studies generally do not
13 present detailed information about the methodologies of these studies (NWCC
14 2004).

15 Even if it were accurate to conclude that eastern wind projects on average
16 have higher fatality rates than western projects, this does not alter the conclusions of
17 my risk assessment. The absolute number of fatalities for an eastern project are still
18 quite low for the size of the bird populations (which range from tens of thousands to
19 tens of millions per species), and orders of magnitude lower than other natural and
20 human-induced causes of bird mortality. Even if the Deerfield Wind Project
21 experienced fatality rates at the eastern average, there would not be an undue adverse
22 impact to bird populations.

1

2 **Bats**

3 **Q. Mr. Darling testifies that ANR recommends a three year post-construction**
4 **bat mortality study, scheduled to minimize human activity that could disrupt bears,**
5 **(Darling pft at 19-22). How do you respond?**

6 Response: Please see my comments above regarding post-construction monitoring
7 options for birds and bats. In regard to bear management concerns, we don't believe
8 the post-construction study effort poses a substantive threat to local bear
9 populations or to individual bears. Our experience within the project area has
10 included a number of direct bear observations, each resulting in a similar and
11 common reaction where the bear quietly moves from or across the open area or
12 roadway and into the adjacent woods.

13 Research technicians typically work quietly for 1 to 2 hours within a standard
14 search area centered around an individual turbine, following a specific and regular
15 transect pattern before moving to another turbine. Trash or other attractants are not
16 left behind to draw bears or other scavengers, not only as a matter of principle but
17 also so as not to potentially influence the ongoing study results. Additionally, we
18 note ongoing scavenger surveys at various other sites incorporating use of bird and
19 bat carcasses have, to date, not been found to attract bears. We also note dogs that
20 may be periodically employed during the course of investigations are typically leashed
21 so as to improve their efficiency of detecting carcasses. Although localized
22 movements of individual bears may be occasionally altered by the presence of

1 research technicians conducting periodic, seasonal surveys, bears will still be able to
2 freely move around the source of disturbance.

3

4 **Q. Mr. Darling states that post-construction mortality levels exceeding either**
5 **three migratory bats per turbine per year, five common bats per turbine per year, or**
6 **any endangered bat species would be a concern to ANR (Darling pft at 17-18). Mr.**
7 **Darling recommends that if fatalities exceed these levels, Deerfield and the ANR**
8 **should pursue adaptive management through operational adjustments based on**
9 **dates, temperature, and wind (Darling pft at 22). How do you respond?**

10 Response: I agree with Mr. Darling that efforts ultimately should be made towards
11 developing a legitimate threshold number that triggers certain defined actions,
12 particularly one that differentiates between common and endangered species,
13 perhaps even migratory and common species. Certain bat species appear to be more
14 at risk than others due to their particular habitat requirements, phenology, or
15 behavioral ecology, and more vulnerable overall due to their limited reproduction
16 capabilities. Consequently, certain local populations may be more susceptible to
17 direct disturbances or cumulative impacts over time. We also currently do not
18 understand what, if any, effect White Nose Syndrome may play on local and regional
19 populations.

20 However, far too little is currently known about existing regional or local bat
21 populations – common or rare – to associate a meaningful threshold number at this
22 time. Currently a typical range for eastern projects is 9-53 bats/MW/year. We
23 generally understand which species are regionally more common but have only a very

1 limited understanding of when, how, or how far, individuals move within the
2 landscape. It's important to note that the wind industry has been a leading
3 contributor to our current base of knowledge and understanding of bat ecology in
4 the northeast.

5 The use of a specific number now without input from ongoing and future
6 post-construction monitoring efforts would be premature and not scientifically
7 based. My concern is that Mr. Darling's proposed threshold numbers are
8 unrealistically low. There are currently measures in place for protecting listed
9 threatened or endangered species through the incidental take permit process under
10 the federal Endangered Species Act and Vermont's Chapter 123: Protection of
11 Endangered Species Act. We should continue to utilize these management tools as a
12 means of protecting individual species that may be at risk.

13 I also agree with Mr. Darling that adaptive management controls can
14 ultimately provide a responsible means of limiting risk. Defining the parameters of
15 individual factors is the current Holy Grail for bat researchers investigating the
16 potential effects of wind development on avian and bat populations. However, a
17 great deal of valuable data and information is currently being collectively generated
18 with ongoing post-construction studies, many of which are helping to provide more
19 narrow windows of potential vulnerability on a seasonal, nightly, and perhaps even
20 hourly basis, and in accordance with specific weather conditions. All of these can
21 potentially combine to offer a viable means of protecting individual species and
22 populations while minimizing unnecessary operational constraints on wind projects.

23

1 **Q. Does this conclude your testimony at this time?**

2 Response: Yes, it does.

3

4 **Citations:**

5 The Wildlife Society. 2007. Impacts of wind energy facilities on wildlife and wildlife
6 habitat. Technical Review 07-2. Technical Review Committee on Wind Energy Facilities
7 and Wildlife. 5410 Grosvenor Lane, Suite 200. Bethesda, MD 20814.

8

9 National Research Council. 2007. Environmental impacts of wind-energy projects.
10 Committee on Environmental Impacts of Wind Energy Projects. Board on Environmental
11 Studies and Toxicology. Division on Earth and Life Studies. The National Academies
12 Press. Washington, D.C.

13

14 National Wind Coordinating Committee. 2004. Wind turbine interactions with
15 birds and bats: a summary of research results and remaining questions. Fact Sheet: Second
16 Edition. November 2004.

APPENDIX TABLE 1 PUBLICLY AVAILABLE STUDIES

| Season | Year | Project Site | Number of Survey Nights | Number of Survey Hours | Landscape | Average Passage Rate (t/km/hr) | Range in Nightly Passage Rates | Average Flight Direction | Average Flight Height (m) | % Targets Below Turbine Height | Percent Below | Citation |
|--------------------|------|---|-------------------------|------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------|---------------------------|--------------------------------|---------------|----------------------------|
| Spring 2003 | | | | | | | | | | | | |
| Spring | 2003 | Westfield Chautauqua Cty, NY | 30 | 150 | Great Lakes Shore | 395 | 15-1702 | 29 | 528 | (125 m) 4% | 4 | Cooper <i>et al.</i> 2004a |
| Fall 2003 | | | | | | | | | | | | |
| Fall | 2003 | Westfield Chautauqua Cty, NY | 30 | 180 | Great Lakes shore | 238 | 10-905 | 199 | 532 | (125 m) 4% | 4 | Cooper <i>et al.</i> 2004c |
| Fall | 2003 | Mt. Storm, Grant Cty, WV | 45 | 270 | Forested ridge | 241 | 8-852 | 184 | 410 | n/a | | Cooper <i>et al.</i> 2004b |
| Fall 2004 | | | | | | | | | | | | |
| Fall | 2004 | Franklin, Pendleton Cty, WV | 34 | 349 | Forested ridge | 229 | 18-643 | 175 | 583 | (125 m) 8% | 8 | Woodlot 2005a |
| Fall | 2004 | Prattsburgh, Steuben Cty, NY | 30 | 315 | Agricultural plateau | 193 | 12-474 | 188 | 516 | (125 m) 3% | 3 | Woodlot 2005b |
| Fall | 2004 | Prattsburgh, Steuben Cty, NY | 45 | 292.5 | Agricultural plateau | 200 | 18-863 | 177 | 365 | (125 m) 9.2% | 9 | Mabee <i>et al.</i> 2005a |
| Fall | 2004 | Martindale, Lancaster, Cty, PA | n/a | n/a | Reclaimed minelands | 187 | n/a | 188 | 436 | (n/a) 8% | 8 | Young 2006 |
| Fall | 2004 | Casselman, Somerset Cty, PA | n/a | n/a | Reclaimed minelands | 174 | n/a | 219 | 448 | (n/a) 7% | 7 | Young 2006 |
| Fall | 2004 | Deerfield, Bennington Cty, VT (Existing Facility) | 28 | 300 | Forested ridge | 175 | 7-519 | 194 | 438 | (100 m) <1% | 1 | Woodlot 2005c |
| Fall | 2004 | Deerfield, Bennington Cty, VT (Western Expansion) | 14 | 159 | Forested ridge | 193 | 8-1121 | 223 | 624 | (100 m) 5% | 5 | Woodlot 2005c |
| Fall | 2004 | Deerfield, Bennington Cty, VT (Valley Site) | 13 | 136 | Forested ridge | 150 | 58-404 | 214 | 503 | (100 m) <1% | 1 | Woodlot 2005c |
| Fall | 2004 | Deerfield, Bennington Cty, VT (3 sites combined) | 28 | 595 | Forested ridge | 178 | 7-1121 | 212 | 611 | (100 m) 3% | 3 | Woodlot 2005c |
| Fall | 2004 | Sheffield, Caledonia Cty, VT | 18 | 176 | Forested ridge | 114 | 19-320 | 200 | 566 | (125 m) 1% | 1 | Woodlot 2006a |
| Spring 2005 | | | | | | | | | | | | |
| Spring | 2005 | Churubusco, Clinton Cty, NY | 39 | 310 | Great Lakes plain/ADK foothills | 254 | 3-728 | 40 | 422 | (120 m) 11% | 11 | Woodlot 2005d |
| Spring | 2005 | Ellenberg, Clinton Cty, NY | n/a | n/a | Great Lakes plain/ADK foothills | 110 | n/a | 30 | 338 | (n/a) 20% | 20 | Mabee <i>et al.</i> 2006a |
| Spring | 2005 | Dairy Hills, Clinton Cty, NY | n/a | n/a | Great Lakes shore | 117 | n/a | 14 | 397 | (n/a) 15% | 15 | ED&R 2006a |
| Spring | 2005 | Clayton, Jefferson Cty, NY | 36 | 303 | Agricultural plateau | 450 | 71-1769 | 30 | 443 | (150 m) 14% | 14 | Woodlot 2005e |
| Spring | 2005 | Sheldon, Wyoming Cty, NY | 38 | 272 | Agricultural plateau | 112 | 6-558 | 25 | 418 | (120 m) 6% | 6 | Woodlot 2006b |
| Spring | 2005 | Prattsburgh, Steuben Cty, NY | 20 | 183 | Agricultural plateau | 277 | 70-621 | 22 | 370 | (125 m) 16% | 16 | Woodlot 2005f |
| Spring | 2005 | Prattsburgh, Steuben Cty, NY | 30 | 270 | Agricultural plateau | 170 | 3-844 | 18 | 319 | (125 m) 18% | 18 | Mabee <i>et al.</i> 2005a |
| Spring | 2005 | Cohocton, Steuben Cty, NY | 3 | 29 | Agricultural plateau | 371 | 133-773 | 28 | 609 | (125 m) 12% | 12 | ED&R 2006b |
| Spring | 2005 | Munnsville, Madison Cty, NY | 41 | 388 | Agricultural plateau | 160 | 6-1065 | 31 | 291 | (118 m) 25% | 25 | Woodlot 2005g |
| Spring | 2005 | Fairfield, Herkimer Cty, NY | 40 | 369 | Agricultural plateau | 509 | 80-1175 | 44 | 419 | (125 m) 20% | 20 | Woodlot 2005h |
| Spring | 2005 | Jordanville, Herkimer Cty, NY | 40 | 364 | Agricultural plateau | 409 | 26-1410 | 40 | 371 | (125 m) 21% | 21 | Woodlot 2005i |
| Spring | 2005 | Sheffield, Caledonia Cty, VT | 20 | 179 | Forested ridge | 208 | 11-439 | 40 | 522 | (125 m) 6% | 6 | Woodlot 2006a |
| Spring | 2005 | Deerfield, Bennington Cty, VT | 20 | 183 | Forested ridge | 404 | 74-973 | 69 | 523 | (125 m) 4% | 4 | Woodlot 2005j |
| Spring | 2005 | Franklin, Pendleton Cty, WV | 23 | 204 | Forested ridge | 457 | 34-240 | 53 | 492 | (125 m) 11% | 11 | Woodlot 2005k |
| Fall 2005 | | | | | | | | | | | | |
| Fall | 2005 | Churubusco, Clinton Cty, NY | 38 | 414 | Great Lakes plain/ADK foothills | 152 | 9-429 | 193 | 438 | (120 m) 5% | 5 | Woodlot 2005l |
| Fall | 2005 | Ellenberg, Clinton Cty, NY | n/a | n/a | Great Lakes plain/ADK foothills | 197 | n/a | 162 | 333 | (n/a) 12% | 12 | Mabee <i>et al.</i> 2006a |
| Fall | 2005 | Dairy Hills, Clinton Cty, NY | n/a | n/a | Agricultural plateau | 94 | n/a | 180 | 466 | (n/a) 10% | 10 | Young <i>et al.</i> 2006 |
| Fall | 2005 | Flat Rock, Lewis Cty, NY | n/a | n/a | Great Lakes plain/ADK foothills | 158 | n/a | 184 | 415 | (n/a) 8% | 8 | ED&R 2006a |
| Fall | 2005 | Clayton, Jefferson Cty, NY | 37 | 385 | Agricultural plateau | 418 | 83-877 | 168 | 475 | (150 m) 10% | 10 | Woodlot 2005m |
| Fall | 2005 | Bliss, Wyoming Cty, NY | 8 | n/a | Agricultural plateau | 440 | 52-1392 | n/a | 411 | (125 m) 13% | 13 | Young 2006 |
| Fall | 2005 | Perry, Wyoming Cty, NY | n/a | n/a | Agricultural plateau | 64 | n/a | 180 | 466 | (125 m) 10% | 10 | Young 2006 |
| Fall | 2005 | Sheldon, Wyoming Cty, NY | 36 | 347 | Agricultural plateau | 197 | 43-529 | 213 | 422 | (120 m) 3% | 3 | Woodlot 2005n |
| Fall | 2005 | Howard, Steuben Cty, NY | 39 | 405 | Agricultural plateau | 481 | 18-1434 | 185 | 491 | (125 m) 5% | 5 | Woodlot 2005o |
| Fall | 2005 | Fairfield, Herkimer Cty, NY | 38 | 423 | Agricultural plateau | 691 | 116-1351 | 198 | 516 | (125 m) 4% | 4 | Woodlot 2005p |
| Fall | 2005 | Jordanville, Herkimer Cty, NY | 38 | 404 | Agricultural plateau | 380 | 26-1019 | 208 | 440 | (125 m) 6% | 6 | Woodlot 2005q |
| Fall | 2005 | Munnsville, Madison Cty, NY | 31 | 292 | Agricultural plateau | 732 | 15-1671 | 223 | 644 | (118 m) 2% | 2 | Woodlot 2005r |
| Fall | 2005 | Deerfield, Bennington Cty, VT | 32 | 324 | Forested ridge | 559 | 3-1736 | 221 | 395 | (100 m) 13% | 13 | Woodlot 2005s |
| Fall | 2005 | Kibby, Franklin Cty, ME (Mountain) | 12 | 115 | Forested ridge | 565 | 109-1107 | 167 | 370 | (125 m) 16% | 16 | Woodlot 2006d |
| Fall | 2005 | Kibby, Franklin Cty, ME (Range 1) | 12 | 101 | Forested ridge | 201 | 12-783 | 196 | 352 | (125 m) 12% | 12 | Woodlot 2006d |
| Fall | 2005 | Kibby, Franklin Cty, ME (Valley Site) | 5 | 13 | Forested ridge | 452 | 52-995 | 193 | 391 | (125 m) 16% | 16 | Woodlot 2006d |
| Fall | 2005 | Mars Hill, Aroostook Cty, ME | 18 | 117 | Forested ridge | 512 | 60-1092 | 228 | 424 | (120 m) 8% | 8 | Woodlot 2005t |
| Spring 2006 | | | | | | | | | | | | |
| Spring | 2006 | Chateaugay, Franklin Cty, NY | 35 | 300 | Agricultural plateau | 360 | 54-892 | 48 | 409 | (120 m) 18% | 18 | Woodlot 2006e |
| Spring | 2006 | Wethersfield, Wyoming Cty, NY | 44 | n/a | Agricultural plateau | 324 | 41-907 | 12 | 355 | (125 m) 19% | 19 | Mabee <i>et al.</i> 2006b |
| Spring | 2006 | Centerville, Allegany Cty, NY | 42 | n/a | Agricultural plateau | 290 | 25-1140 | 22 | 351 | (125 m) 16% | 16 | Mabee <i>et al.</i> 2006b |
| Spring | 2006 | Howard, Steuben Cty, NY | 42 | 440 | Agricultural plateau | 440 | 35-2270 | 27 | 426 | (125 m) 13% | 13 | Woodlot 2006f |
| Spring | 2006 | Deerfield, Bennington Cty, VT | 26 | 236 | Forested ridge | 263 | 5-934 | 58 | 435 | (100 m) 11% | 11 | Woodlot 2006g |
| Spring | 2006 | Kibby, Franklin Cty, ME (Mountain) | 6 | 33 | Forested ridge | 456 | 88-1500 | 67 | 368 | (120 m) 14% | 14 | Woodlot 2006h |
| Spring | 2006 | Kibby, Franklin Cty, ME (Range 1) | 10 | 80 | Forested ridge | 197 | 6-471 | 50 | 412 | (120 m) 22% | 22 | Woodlot 2006h |
| Spring | 2006 | Kibby, Franklin Cty, ME (Range 2) | 7 | 57 | Forested ridge | 512 | 18-757 | 86 | 378 | (120 m) 25% | 25 | Woodlot 2006h |
| Spring | 2006 | Kibby, Franklin Cty, ME (Valley Site) | 2 | 14 | Forested valley | 443 | 45-1242 | 61 | 334 | (120 m) n/a | | Woodlot 2006h |
| Spring | 2006 | Mars Hill, Aroostook Cty, ME | 15 | 85 | Forested ridge | 338 | 76-674 | 58 | 384 | (120 m) 14% | 14 | Woodlot 2006i |
| Fall 2006 | | | | | | | | | | | | |
| Fall | 2006 | Chateaugay, Franklin Cty, NY | 35 | 327 | Agricultural plateau | 643 | 38-1373 | 212 | 431 | (120 m) 8% | 8 | Woodlot 2006i |
| Fall | 2006 | Wethersfield, Wyoming Cty, NY | 56 | n/a | Agricultural plateau | 256 | 31-701 | 208 | 344 | (125 m) 11% | 11 | Mabee <i>et al.</i> 2006c |
| Fall | 2006 | Centerville, Allegany Cty, NY | 57 | n/a | Agricultural plateau | 259 | 12-877 | 208 | 350 | (125 m) 12% | 12 | Mabee <i>et al.</i> 2006c |
| Fall | 2006 | Lempster, Sullivan Cty, NH | 32 | 290 | Forested ridge | 620 | 133-1609 | 206 | 387 | (125 m) 8% | 8 | Woodlot 2007a |
| Fall | 2006 | Stetson, Penobscot Cty, ME | 12 | 77 | Forested ridge | 476 | 131-1192 | 227 | 378 | (125 m) 13% | 13 | Woodlot 2007b |
| Fall 2007 | | | | | | | | | | | | |
| Spring | 2007 | Stetson, Washington Cty, ME | 21 | 138 | Forested ridge | 147 | 3-434 | 55 | 210 | (120 m) 22% | 22 | Woodlot |
| Spring | 2007 | Laurel Mountain, VA | 20 | 197 | Forested ridge | 277 | 13-646 | 27 | 533 | (130 m) 3% | 3 | Woodlot |