Critical review of Chautauqua Windpower, LLC Avian Risk Assessment

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Because of my expertise in the field of nocturnal bird migration and my experience with the issue of avian impacts at wind energy projects, I was asked by the Citizens for Responsible Wind Power in fall 2003 to review the Avian Risk Assessment (ARA) of the proposed Chautauqua Windpower project in the vicinity of Westfield and Ripley, New York. The ARA became available to me on June 15, 2004. I have read the portions of the assessment concerning impact on nocturnal bird migration and have the following comments:

The ARA tries to make the case that mortality to night migrating birds will be insignificant based on the following evidence, listed in the order presented in the ARA's Executive Summary:

1. That wind turbine mortality is minor compared with other sources of mortality.
2. That their field data from the proposed project site along with mortality and field data from other wind projects indicate that the mortality from their proposed project will be minimal and in the range of other wind projects that have been studied.

The first point is standard rhetoric used in the commercial wind industry to minimize concern about avian mortality. The comparison, first collated by Erickson, et al. in 2001, seems on the surface to make a good point. But a number of major flaws exist.

Erickson, et al. report bird mortality rates at commercial wind facilities throughout the U.S., adjusted for search efficiency and carcass scavenging, ranging from 0 to 4.45 bird/ turbine/ year, and averaging 2.19. However, it is important to point out that this average is geographically biased by mortality studies in western U.S. Of the 15,000 or so turbines that were expected to be operating in North America by 2001, 3,500 were estimated to be outside of California. Approximately 510 turbines from outside of California were included in mortality studies in which Erickson, et al. derived their 2.19 figure. However, only two of these mortality studies involving 19 turbines were located east of the Mississippi River (Searsburg, VT, Somerset, PA).

Given this, it is a major oversight that Erickson, et al. failed to point out that songbird mortality at tall man-made structures is a phenomenon that is well documented in eastern North America but does not appear to be as large a phenomenon in the west (Avery et al., 1980). This has been theorized to be due to the lower density of nocturnal migration in the west and different weather patterns. Whatever the cause, figures from mortality studies in the west should not be used to project mortality rates at proposed wind sites in

the east. To make this point in the extreme, one certainly would not use mortality studies from wind turbines at the North Pole to calculate the impacts of commercial wind energy on neotropical migrants in the U. S. Since the Erickson, et al. comparison was published, mortality studies at two wind plants in the east (Backbone Mountain, WV and Buffalo Mountain, TN) have shown mortality rates much higher than the Erickson, et al. derived "national average". These latter studies also indicate what had been strongly suggested by the Avery, et al. bibliography -that a higher proportion of avian mortality at commercial wind energy in the east will be from protected passerines that migrate at night.

The most egregious error in the Erickson, et al. document is that they have made their comparison too early in the build-out of commercial wind energy. To provide perspective on this, one can look at eastern North America (east of the Mississippi) where there are currently ~300 turbines (> 200-ft structures). I think everyone would agree that the avian mortality at these ~300 turbines is much less than that caused by all the autos in the east, or all the cats in the east, or all the windows in the east, or all the communications towers in the east, or all the tall buildings in the east. It is ridiculous to even make such a mortality comparison at this stage in the development of commercial wind energy.

The U. S. Department of Energy has made projections on commercial wind potential for each state. When one adds up the number of turbines to fill this projection (based on 1.5 MW/ turbine size) it is not unrealistic to see that eastern North America could support potentially half a million land based wind turbines. Erickson, et al. should have given more attention to the anticipated number of wind turbines in 2025 (rather than 2001) in comparing commercial wind power mortality to that from other sources of mortality in the east. I reiterate that future comparisons should analyze eastern U. S. separately form western U. S. Given currently documented mortality rates of about 2 to 10 birds and 2 to ~80 bats per turbine documented in the east, the projected impact of turbines in eastern U. S. could be in the range of 1-5 million birds per year and 1 □ 40 million bats per year.

Of course, there are many factors that can affect these estimates. One factor is that the exact number and the dimensional characteristics of turbines in the completed build-out are unknown. Another factor is that there are so few mortality studies carried out so far, that the confidence level in the current mortality rates are very low. A third factor is that by the time the projected build-out occurs (20-30 years?), population changes for many night migrating animals are likely to decline further and thus comes the irony that less mortality would occur and therefore commercial wind turbines would be less of a problem for existing populations. The five long-term communications tower mortality studies that exist in eastern North America all showed an order of magnitude decline in annual mortality from roughly 1960 to 1980. The reason for the decline is not fully understood as this is much greater than the avian population decline during the period estimated from other monitoring methods, but population decline is suspected to be one factor contributing to this lower tower mortality.

The point here is that it appears wind turbine mortality for migrant songbirds is very likely to be at least in the range of communication tower mortality. It is certainly not low enough that we can brush it aside and careful attention needs to be applied to siting wind

energy facilities because this is currently the primary means we have for mitigating avian (and bat) mortality.

Another misleading aspect of the Erickson, et al. mortality comparison is that there is no substantive consideration for the differences in species affected by the various mortality sources they consider. For example, the high mortality figures associated with cats and windows predominantly involve plentiful species that are common in suburban and residential neighborhoods or in the vicinity of farms, whereas the species killed at commercial wind turbine facilities and communications towers are largely neotropical migrant songbirds; species of conservation concern that nest in our wild lands. From the evidence available, it appears large scale development of commercial wind energy in the Americas will have some, as yet unknown, impact on the population levels of sensitive songbird species such the Kirtland's Warbler, Cerulean Warbler, Golden-winged Warbler, Henslow's Sparrow, Painted Bunting and more than 100 other neotropical migrant bird species.

In summary, the proponent's ecological consultants have not provided any service by simply recanting the Erickson, et al. 2001 jargon, which is now widely seen as prematurely conceived.

Below are my comments on the proponent's field studies and their interpretation of this data. Since I am most qualified to speak on the issue of nocturnal migration, I will limit my comments to the proponent's radar studies.

Anyone with field experience or knowledge of the literature on avian night migration might theorize that this project site would have a relatively high avian migration traffic rate during the spring migration period due to concentration effects caused by Lake Erie. Alaska Biological Research (ABR) verified this dynamic in their nocturnal migration study. What is surprising to me in the ABR results is that the fall nocturnal migration traffic rate was higher than fall migration rates they found in three other similar radar studies in New York State:

238 targets/ km/ hr Chautauqua site
~225 targets/ km/ hr near Carthage, NY site
168 targets/ km/ hr Wethersfield site
122 targets/ km/ hr Harrisburg, NY site

I thought that some portion of southbound migration would be steered southwestward along the north shore of Lake Erie and Lake Ontario leading to lower densities crossing these lakes and lower migration rates over the Chautauqua site compared to the two study sites in northern NY (Carthage & Harrisburg). The data instead suggest that there may be some concentration effect along the southeast side of Lake Erie in the fall.

A problem in making any assertions here is that not enough radar data has been gathered in the region. For example, I wonder why ABR's two proximal fall radar studies in Carthage, NY and Harrisburg, NY, less than 30 km apart, show such contrasting

migration rates. The area has relatively homogenous geography with no major features that might theoretically account for the density discrepancy. Assuming the radar data collection methods were consistent at these sites, the only variable that seems like it could be responsible for the difference is the annual migration rate variability. The Carthage study was carried out in fall 1994 and the Harrisburg study was carried out in fall 1999. If this is the case, and radar detected migration rates can vary 40+ % from year to year, then the utility of the currently available radar migration data for making comparisons is questionable.

Regardless of this uncertainty, the spring 2003 nocturnal migration rate radar data from Chautauqua does stand out. Spring migration rates in interior U. S. are typically lower than fall rates due to the large mortality of young birds that occurs in the time since the previous fall migration. As mentioned, however, one might expect the southeastern shore of Lake Erie to concentrate northbound migration. ABR provides a nice discussion of this in their spring and fall reports and their radar data does appear to confirm this phenomenon:

395 targets/ km/ hr Chautauqua site
159 targets/ km/ hr Carthage, NY site
41 targets/ km/ hr Wethersfield site

ABR notes that the spring nocturnal passage rates "generally were higher" than other sites it has studied in New York. I wonder why they use the adjective "generally" to describe a passage rate that is more than 140% greater than either of the two other spring studies they cite and more than 60% greater than any of the three fall studies they cite, especially given the expectation of higher fall passage rates. It certainly seems to be beyond annual variation that ABR's spring radar studies would indicate a 10 times larger nocturnal passage rate at the Chautauqua site compared to the Wethersfield site, only 100 km to the northeast!

Give this understatement by ABR, it is not surprising that the comparatively high spring passage rate detected by surveillance radar is not addressed at all in the ARA outside of the ABR reports where it is noted as "moderate-high" "generally high" or "high". The high spring passage rate detected by the vertical mode is diluted during the ARA calculations of the total number of birds passing through the Wind Resource Area (WRA) under turbine height. This calculation factors in the difference in the average day length between fall and spring migration periods (10 hours versus 8 hours). It also factors in the ~ 7% larger cross sectional width of the WRA in fall (based on the radar-determined mean flight direction during both seasons). The result is that it appears in the ARA that the proposed WRA impact on night migrating animals will be bigger in fall than in spring.

The proponent's ARA touts that its proposed array will parallel the predominant direction of migration, and therefore, they state this arrangement will contribute to minimizing risk. They are basing this on bird avoidance behavior and this is certainly a factor during the day given good visibility. Though some nocturnal avoidance has been documented by

Winkleman (1994) in the Netherlands and Cooper, et al. (2004) at the proposed NedPower facility in West Virginia, the degree to which nocturnal migrants exhibit avoidance behavior is largely unknown.

For nocturnal migrants that do not avoid the parallel turbine string, there is the potential that they may encounter more than one turbine while passing through the ARA. This seems especially likely in the southern portion of the proposed project where there is a string of 8 turbines that appear to precisely parallel the predominant spring nocturnal migration direction determined by ABR. I did not find any place in the ARA where they assessed the risk of birds encountering multiple turbines.

Furthermore, because avoidance behavior cannot be assumed for nocturnal migrants, mortality risk for nocturnal migrants at commercial wind projects needs to be considered differently than for diurnal migrants. To do this, a distinction needs to be made between the risk of the project and the risk of the site. The risk of the project is largely determined by the number of turbines. To a lesser degree is it may be affected by the layout of the turbines. In contrast, the risk of the site is independent of the number of turbines and might conceptually be addressed by studying what impact one representative turbine might have at the proposed project site. This risk would then be compared to the risk of one representative turbine at other wind project sites. This method of evaluating sites eliminates factoring in the width of a project site or the direction of migration in calculating a per turbine mortality figure. It simply uses passage rate below turbine height to evaluate risk.

The Chautauqua ARA calculates risk for nocturnal migrants by factoring in the different cross sectional areas for spring and fall based on the predominant direction of migration determined by radar and then dividing by the number of turbines. Therefore, the less wide the WRA is in the predominant direction of migration, the lower the risk of nocturnal migrants per turbine. However, if the project were to consist of just one turbine, the width of the WRA and the direction of bird migration would not be a factor. If avoidance behavior is not assumed for nocturnal migrants, the risk at the Chautauqua WRA for nocturnal migrants therefore simply becomes the risk of a single turbine multiplied by the number of turbines in the proposed project. Simply stated, the ARA overstates the role of avoidance behavior regarding nocturnal migrants.

Regarding the correction factor for the number of hours of migration in fall and spring (10 hours versus 8 hours), this is a valid correction. However, if the ARA is going to consider this variable (a 20% correction), it should factor in other variables of the same order of magnitude. For example, it should consider the relatively greater importance of spring kills to fall kills regarding impact to species population. Due to the high percentage of juveniles in the fall flight and their concomitant high mortality rate, fall kills do not have the same impact on a population as spring kills. Spring kills likely have at least a 20% greater impact on population than fall kills.

The method of using banding data from regional banding stations to correct for the incomplete radar monitoring is dubious. Banding data does not generally correlate well

with active migration data. For one thing, banding data typically only deals with a limited number of species of songbirds. The radar data reveals all birds (and also bats). Nevertheless, during the latter half of May and early June, it may be the case that the primary species that are migrating are many species of songbirds that might be banded.

To evaluate this further, I looked at nocturnal migration data from a spring 2003 migration study I was carrying out 300-km south of the Chautauqua site. My studies in northern West Virginia indicated that on the night of May 10-11, when ABR logged their big spring migration night, I logged my 3 rd largest night. These West Virginia birds still had to traverse at least 300-km northward before they might pass the Chautauqua site latitude. On May 21 st in West Virginia, I logged my sixth largest flight of the spring. So, it is clear to me that ABR captured part of the peak May flight but they missed a good portion of it that would have occurred over western New York after May 15 th . In interpreting my data, the multipliers used in the Chautauqua ARA seemed like they might, in fact, be roughly accurate. However, this is not an endorsement of the technique they used to come up with their multiplier. More study is needed to see if there is any validity to this method.

The one extrapolation that I have a very hard time accepting is the use of the Stateline wind study's "avian avoidance-mortality factor" for projecting mortality at the Chautauqua site. I think this kind of extrapolation may have a place in the future when more such "avian avoidance-mortality factor" data is available, but at this point the use of this coefficient is premature. We simply have no idea how this figure might vary with species, with weather, with ground reflectivity of light, and numerous other variables. I think if a .0008 factor had been found a five other sites around the continent, I might be able to accept its use at Chautauqua.

The authors of the ARA dig a hole for themselves when they use the fact that the species composition is the same in spring and fall at Stateline (and Chautauqua) to justify their projection of the .0008 factor for the fall Stateline "avian avoidance-mortality factor".

In section 7-11 of the Chautauqua ARA:

"As for nocturnal fall landbirds, similar abundance/ mortality data are lacking. Therefore, the avoidance-mortality factor derived for spring nocturnal migrants (0.0008) is also used for the fall migrant calculations. This is an appropriate approach given the species similarities and other comparable features between the fall and spring, although the migratory season is different."

They then use the .0008 factor in projecting a mortality rate on to the Chautauqua site with no mention of the great species differences between Chautauqua and Stateline. Though the majority of the species killed at Stateline were also species that occur at Chautauqua, there are a great many species that pass over Chautauqua that do not pass over the Stateline site.

Furthermore, the assumption that Stateline nocturnal passage rate data from one migration season will be accurately related to mortality data gathered in a different year isnot likely. Brian Cooper (pers. comm.) and other radar ornithologists admit that fall or spring passage rate data can vary significantly at a site from year to year. This is the reason why the U. S. Fish and Wildlife Service requests more than one year of preconstruction data in site evaluations, to account for annual variation. Ideally, what is needed is concurrent nocturnal migration monitoring and mortality searches.

Another unfounded assumption within the ARA is that the "avian avoidance-mortality factor" varies linearly with changing rate of passage of migrants. With only one data point for the "avian avoidance-mortality factor" there is no way to know how this figure might vary with the larger migration passage rates in the east.

In summary, the fact that so few wind plants have been studied in the east gives us very little statistical power for making comparisons. As far as I know, no preconstruction avian risk assessment has accurately predicted what the mortality will be at a wind energy facility in eastern North America. Beyond general theoretical considerations, the only potential avenue we have for predicting nocturnal bird (and potentially bat) mortality is by comparatively studying nocturnal migration of birds and bats with radar, acoustic, and or thermal imaging studies and correlating the migration traffic rate, altitude, and species data with mortality data. Until more such data is available, we can only make a guess based on the evidence available, but we must be careful not to make statements beyond a reasonable level of confidence. The proponent's ecological team has crossed way over this boundary and hubris oozes from their ARA.

The truth with the avian risk assessment for nocturnal migrants at the proposed Chautauqua WRA is that no one knows what the rate of mortality will be if the project is built. Based on the proponent's evidence and a theoretical consideration of the site, I think that this wind energy facility currently ranks along with the proposed wind facility near Galveston, TX as potentially causing the highest avian mortality per turbine of any wind plant now in existence or proposed for North America. I believe the bat mortality could also potentially be quite high.

It is not likely that any one wind energy facility in this size range (< 40 turbines), even a poorly sited one with regard to bird or bat impacts, will have a measurable effect on continental populations of any species, except possibly those that are endangered or with very limited geographic distribution. However, if this project is permitted to go through it would be very difficult to stop further wind development along the whole southeastern escarpment of Lake Erie. Therefore, the precedent of this project may have significant avian ramifications beyond its bounds.

As a proponent of Green Energy, I am concerned because I find the Chautauqua site selection to be possibly the worst commercial wind energy siting regarding bird impacts so far in eastern North America, and I find the ARA to be without solid foundation. The development of the wind industry has been severely stunted due to bird kill issues in the past. Albeit, the initial projects unwittingly stumbled into the Golden Eagle problem

much as they stumbled into the bat mortality problem last year at the Mountaineer Wind Energy Facility in West Virginia. I am concerned, however, that Chautauqua Windpower LLC seems to be blindly headed forward in envisioning a wind energy facility at a site that has all the warning signs of being a significant bird and bat killer. At this stage in the development of wind energy in the east, I wonder whether this project is worth the risk of bringing bad publicity to the wind industry and potentially slowing down the growth of this important energy resource for the 21st century.