POST-CONSTRUCTION WILDLIFE MONITORING AT THE ATLANTIC CITY UTILITIES AUTHORITY- JERSEY ATLANTIC WIND POWER FACILITY

PROJECT STATUS REPORT IV

Submitted to: New Jersey Board of Public Utilities
New Jersey Clean Energy Program
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INTRODUCTION

The following narrative describes activities New Jersey Audubon Society (NJAS) engaged in during its post-construction wildlife monitoring study conducted at the Jersey Atlantic Wind, LLC (JAW)/Atlantic City Utilities Authority (ACUA) wind power facility. The period covered by this report is 1 January to 31 August 2009 and is the fourth progress report submitted for this project.

WORK PERFORMED

Task 1 - Monitor bird and bat flight patterns using dual mobile radar system

From 1 January - 31 August 2009, we collected data with our dual marine radar system (i.e., horizontally- and vertically-oriented, see previous reports for system description and operation) 24 hours/day. It is important to note that the agreement between NJAS and JAW only provides support for analysis of data collected between sunset and sunrise during "migration" periods (i.e., 16 Mar – 31 May, 16 Jul – 15 Dec) and between sunrise and sunset during the "breeding" and "winter" periods.

During the winter period, we collected radar data two days/week, on average, while during the spring migration period we collected data an average of five days/week. We collected data two days/week, on average, during the breeding season and five days/week, on average for the remainder of the reporting period, which encompassed the beginning of the fall migration period.

Table 1. Start and end dates, number of weeks, data collection effort and total days of data collection for each sampling periods between 1 January and 31 August 2009.

Period	Start Date	End Date	# Weeks	Days/Week	Total days
Winter	1-Jan	15-Mar	10.5	2	21
Spring Migration	16-Mar	31-May	11	5	55
Breeding season*	01-Jun	15-Jul	6.5	2	13
Fall Migration	16-Jul	31-Aug	6.5	5	32.5
Total days for reporting period					121.5

*Overlaps w/spring migration

This resulted in data collection on 121.5 days and approximately 87,500 data images during the reporting period from each radar. The effort described above and in Table 1 adheres to the data collection time frame outlined in the agreement between NJAS and JAW (i.e., 180 days of data collection in each year of the project).

During the reporting period, we completed beta testing of our new data processing software developed using a MATLAB© programming platform. Modifications to our processing software affectively eliminate spurious "targets" produced by energy reflected from the many tall structures on the facility, and in close proximity to the radar. Although revamping our software required considerable time, we believe they were necessary to reduce bias in our estimates of bird/density and altitudinal distribution of birds/bats in the sample area. Our careful review of the new program's performance indicates that it is producing reliable estimates of passage and altitude.

During the reporting period, we began processing data from the first year of the project (1 Aug 2007 – 31 Jul 2008) and completed approximately half. We anticipate that data processing for the entire project period (1 Aug 2007 – 31 Jul 2009) will be completed by the end of January 2010 and a draft final report completed by the end of April 2010. The final report will contain summaries of all radar, carcass search and point count data, analyses that explore relationships among these data sets, and the affects of local and regional weather patterns on bird/bat movement patterns and collision events.

Task 2 - Monitor evidence of bird and bat collisions with wind turbines

During the reporting period, we conducted systematic searches three days per week on the ACUA facility for birds and bats that apparently collided with on-site wind turbines. Searches were conducted around each turbine by a single, trained NJAS staff person (see previous report for detailed description of search methodology). This resulted in approximately 515 hours (103 days, approximately five hours/search day) of searching.

The following is a preliminary account of the birds and bats we encountered during our searches for collision events. The numbers of carcasses we report here are uncorrected for observer efficiency or scavenger removal. Additionally, these estimates are not corrected for the area around turbines not searched because they were inaccessible. Correcting for these biases will increase our estimates of collision mortality.

During the reporting period, eight birds of at least seven species (i.e., two were unidentifiable) were discovered during systematic searchers around turbines (see Table 2). Laughing Gull (*Larus atricilla*) was encountered two times and continues to be the most frequently encountered bird on our mortality searches. Three of the birds were first time encounters for the survey: Barn Swallow (*Hirundo rustica*), Dunlin (*Calidris alpina*) and Green Heron (*Butorides virescens*). On 18 August 2009 an Osprey (*Pandion haeliatus*) was found by facility workers and reported to us. Although we were unable to evaluate the cause of death, facility workers were certain that it resulted from collision with a wind turbine, based on a significant laceration across the birds chest. This is the fourth Osprey mortality at the facility and the third encountered or reported since our study began in August 2007. Since the beginning of the project (i.e., August 2007) we have encountered 40 bird carcasses, two of

which appear unrelated to collisions with the wind turbines. The 38 putative bird collisions included at least 25 species.

Table 2. Date, time, turbine location, species and GPS coordinates of birds found at the ACUA wind power facility during systematic searches conducted betweem 1 January and 31 August 2009.

Date	Time	Turbine	Species/Identify	Easting	Northing	Notes
03/09/09	1230	T2	Dunlin	547537	4359437	Not collected/wings & keel only.
05/27/09	0900	T4	Unidentified sm. passerine	547370	4359321	Not collected/wing & sm. part of body
05/27/09	0925	T1	Unidentified sm. passerine	547439	4359092	Not collected/wing & some feathers
06/08/09	0750	T2	Laughing Gull	547499	4359538	Two wings only.
06/24/09	0745	T2	Laughing Gull	547765	4359511	Not collected.
07/31/09	1000	T1	Barn Swallow	547363	4359319	Not collected. Under truck.
08/18/09	-	T3	Osprey	547546	4359241	Collected/removed by ACUA staff.
08/24/09	0000	T4	Green Heron	547408	4359091	Not collected.

Five bats were discovered during the reporting period. Eastern red bat (*Lasiurus borealis,* four times) and hoary bat (*Lasiurus cinereus,* one time) were the only species encountered. Fifty-eight bat carcasses have been located during our searches since the start of the project and to-date, we have encountered only two species: Eastern red bat and hoary bat. During our searches, we have encounterd three times as many red bats as hoary bats and our data suggest that more than 85% of all bat collision events occur during August and September.

Our data also suggest that bird and bat collisions are not evenly distributed among turbines. When we adjusted the number of bird carcasses found to account for the proportion of "searchable area" around each turbine (i.e., see earlier reports for map of "searchable" and "search" areas) relative to the total search area, we found the greatest proportion of bird carcasses at turbine #2 (0.39 of total carcasses encountered, Table 3, see earlier reports for turbine/# locations). Turbine #2, is the most northerly of the five turbines and is located right along the marsh edge that is bordered by a large channel. Conversely, the lowest proportion of carcasses we encountered was at turbine #5 (0.10 of total carcasses encountered, Table 3). The distribution of bat carcasses encountered appeared more uniform among the five turbines compared to birds. Turbines #2, #3 and #4 accounted for approximately 0.70 of the total carcasses we found (Table 4), while Turbines #1 and #5 accounted for approximately 0.30 of the total carcasses (Table 4).

Table 3. Proportion of bird carcasses encountered from August 2007 – August 2009 at each turbine after adjusting for unequal search area (i.e., proportion of area searchable)

Turbine	Carcasses encountered (raw)	Proportion of area searchable*	Carcasses encountered (adjusted)**	Proportion of all carcasses encountered
1	4	0.32	12.37	0.15
2	10	0.31	32.47	0.39
3	14	0.83	16.87	0.20
4	8	0.64	12.52	0.15
5	2	0.24	8.22	0.10

*Relative to total search area (16,900 m^2)

Table 4. Proportion of bat carcasses encountered from August 2007 – August 2009 at each turbine after adjusting for unequal search area (i.e., proportion of area searchable)

Turbine	Carcasses encountered (raw)	Proportion of area searchable*	Carcasses encountered (adjusted)**	Proportion of all carcasses encountered
1	6	0.32	18.56	0.16
2	8	0.31	25.98	0.22
3	20	0.83	24.10	0.21
4	20	0.64	31.30	0.27
5	4	0.24	16.44	0.14

*Relative to total search area (16,900 m^2)

**Carcasses encountered (raw)/Proportion of searchable area

We also conducted four searcher efficiency and scavenger removal trials during the reporting period. A detailed justification for this activity and the particular methods and protocols used are described in our first report. The fact that estimates of animal fatalities at wind power generating facilities can be dramatically affected by differences in observer efficiency and from carcass removal by a variety of

scavengers is widely acknowledged (Morrison 2002). Consequently, estimates of total bird or bat fatalities can only be determined after correcting for searcher and carcass removal biases.

After two years of study we have generated reliable estimates of observer efficiency and scavenger removal based on 20 trials. We found that on average, our observers detected 37% of the carcasses in the trials and that scavengers removed 27% of carcasses during the 2-3 day interval between searches. We used these elements, along with the ratio of searchable to total search area in the following equation (Jain et al. 2007),

$$C_{hat}=(C/(S_c*S_e*P_s)),$$

to adjust our carcass estimates. In this equation C = the number of carcasses detected, S_c is the proportion scavenged, S_e is the observer detection efficiency and P_s is the proportion of the area searched. This adjustment resulted in an estimate of 302 bird carcasses over the two year study period, or approximately 30 birds/turbine/year. For the same study period, this adjustment resulted in an estimate of 461bats, or approximately 46 bats/turbine/year. In the final report, these estimates will be analyzed to investigate how collisions events vary by season, with local and regional weather patterns and are related to daily variation in the magnitude and altitude of passage.

Task 3 - Monitor temporal and spatial bird abundance and distribution patterns on the ACUA wind power facility

We conducted 31 weekly, systematic point count surveys to determine abundance and distribution of residents and transient birds throughout the reporting period. Surveys began at sunrise and were conducted at five points, each randomly selected within the general area of a turbine. We followed standard point count data collection protocols, which included recording observations in 2-, 3-, and 5-minute sampling periods, and recording distance and direction of each detection. We will compare these data to our carcass encounter and radar data to (1) assess relationships between bird densities on site and the number of carcasses we found and the number of targets we detect using radar the previous night and (2) investigate relationships between the species composition of birds detected during point counts and carcass searches.