THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE
DOCKET NO. 2012-01
APPLICATION OF ANTRIM WIND ENERGY, LLC
FOR A CERTIFICATE OF SITE AND FACILITY
PRE-FILED DIRECT TESTIMONY OF CAROL R. FOSS
ON BEHALF OF THE
AUDUBON SOCIETY OF NEW HAMPSHIRE

July 31, 2012

Qualifications of Carol R. Foss

Q. Please state your name and business address.

A. My name is Carol R. Foss and my business address is 84 Silk Farm Road, Concord, NH 03301.

Q. Who is your current employer and what position do you hold?

A. I am employed by the Audubon Society of New Hampshire (ASNH) and I hold the position of Director of Conservation.

Q. Please summarize your educational and professional background and experience.

A. I hold a Bachelor of Arts Degree in Biology from Colby College in Waterville, Maine, a Master of Science Degree in Zoology from the University of Connecticut, Storrs, Connecticut, and a Doctor of Philosophy Degree in Wildlife Ecology from the University of Maine, Orono, Maine. I have worked as a conservation biologist for 32 years, primarily in New Hampshire.

Detailed information concerning my background and experience is provided in my curriculum vitae, which is attached to this testimony and is labeled CRF-1.

Q. Please describe your current employment responsibilities.

A. I oversee the conservation biology and environmental policy efforts of ASNH. My responsibilities include supervising six staff scientists (including a biologist who specializes on birds of prey) and variable numbers of seasonal technicians and volunteers; developing and implementing research proposals; overseeing contracts for inventory, monitoring, and management of selected wildlife species of concern; representing ASNH on various state and regional technical and advisory committees; preparing testimony and comments for public hearings and comment periods in collaboration with the ASNH President and Environmental Policy Committee; and advising municipal planning boards on strategies for protecting natural resources.

Q. Are you familiar with the project that is the subject of this docket?

A. Yes. I have reviewed the application, associated appendices, and the raptor migration data collected by the applicant. I have personally viewed the project area from several nearby locations, and attended the June 27-29 technical sessions.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of this testimony is to provide information regarding the potential impact of the proposed project on birds of prey in general, and eagles in particular.

Q. How does local topography influence the travel routes of migrating raptors?

A. Raptors conserve energy during migration by using thermal lift from rising pockets of warm air and orographic lift from winds deflected upward by linear ridges. Areas that absorb more heat relative to their surroundings, such as the southeast face of slopes and large expanses of pavement, generate thermal lift on warm, calm days. Linear ridges oriented perpendicular to prevailing (northwest) winds create orographic lift on windy days. Migrating raptors, including Golden Eagles, concentrate along these features.

Q. Does turbine placement with respect to local topography affect collision risk for migrating raptors in general and migrating Golden Eagles in particular?

A. Linear ridges such as the project area concentrate migrating raptors, and are called "leading lines." Turbines located along such ridges create potentially high risks for migrating raptors that use orographic lift (Kerlinger 1989, Katzner et al. in press). While thermals may extend to altitudes exceeding 1000 meters AGL (Katzner et al. in press), orographic lift typically extends only to approximately 200 meters AGL above a peak or ridgeline (Duerr et al. 2012). Thus, raptors using orographic lift often travel at altitudes within rotor-swept zones of wind facilities. Raptors using orographic lift also concentrate along the windward side of Appalachian peaks and ridges that have attractive resources for wind energy development (Allen et al. 1996, Bohrer et al. 2011).

Q. What raptor species are most vulnerable to collision with wind turbines in the United States?

A. Golden Eagles, Red-tailed Hawks, and American Kestrels appear to be the raptor species most vulnerable to collision with wind turbines in the United States; Sharp-shinned Hawks and

Turkey Vultures have also been killed by wind turbines (Orloff and Flannery 1992, Jain et al. 2009). In New England, an Osprey was killed at the single turbine located at the Massachusetts Maritime Academy in Bourne (Vlietstra 2007).

Q. How many Golden Eagles have been killed by wind turbines?

A. Annual Golden Eagle mortality at the Altamont Pass Wind Resource Area in the Diablo Mountains of California is estimated at 40-60 adults and sub-adults (Hunt 2002). Sharp et al. (2011) report 54 individuals killed at other locations in California, Wyoming, Oregon, and Washington. Not all Golden Eagles killed by wind turbines have been documented or reported.

Q. Why are Golden Eagles particularly vulnerable to collision with wind turbines?

A. Eastern Golden Eagles migrate predominantly in early spring and late fall, when cooler temperatures and stronger winds typically limit the availability of thermal lift. High resolution GPS data from migrating Golden Eagles show that flight altitude decreases as wind speed increases (Lanzone et al. 2012).

Q. What is the typical flight altitude of Golden Eagles migrating through the northern Appalachians?

A. Migrating Golden Eagles typically migrate at altitudes of approximately 100-200 meters above ground level (AGL) over summits, ridgetops, cliffs, and steep slopes and altitudes of approximately 170 to 350 meters over side slopes (Katzner et al. in press).

Q. What is the status and distribution of the Golden Eagle population in eastern North America?

A. Raptor biologists estimate that a population of 1,000-2,500 Golden Eagles migrates between a summer range in northern Ontario, northern Quebec, and Labrador and wintering areas in the United States, primarily in the Mississippi Valley, the Great Lakes region, and the Appalachian Mountains (Katzner et al. 2012).

Q. Is the project area within a documented Golden Eagle migration corridor?

A. The project area is within a documented Golden Eagle migration corridor used by individuals that summer on the Gaspe Peninsula of Quebec and winter primarily in New York and Pennsylvania (Katzner et al. 2012).

Q. Have migrating Golden Eagles been observed in the project area?

A. Yes. The raptor migration surveys conducted by consultants for the applicant during the fall of 2011 documented a total of three Golden Eagles from their observation site on the southeast flank of Willard Mountain (TRC Engineers 2011).

Q. How does the Golden Eagle passage rate observed during pre-construction raptor migration surveys compare with those for other migration counts in the region?

A. Twelve hawkwatch sites in Maine, New Hampshire, Vermont, and Massachusetts have fall count data posted on the Hawk Migration Association of North America (HMANA) website (http://hawkcount.org/month_summary) for the years 2007-2011, providing a total of 45 site-years of data. Of these, 27 include at least one Golden Eagle observation. Passage rates for the 27 site-years range from 0.004 to 0.037 Golden Eagles per observation hour (GE/hr), with a mean and a median of 0.017 GE/hr. The documented passage rate for Antrim wind was 0.020 GE/hr, slightly above the mean (TRC Engineers 2011). Raptor migration surveys for the

Lempster, Granite Reliable, and Groton wind projects documented no Golden Eagles (Louis Berger Group 2006, Stantec Consulting 2007, Stantec Consulting 2009).

Q. How did you determine these passage rates?

A. Since some raptor migration surveys begin before Golden Eagles begin fall migration, I determined the earliest (12 September) and latest (5 December) dates of Golden Eagle observations at the 12 sites during the five-year period, and used those dates to define the "window of possibility" for Golden Eagle migration in the region. I then added the observation hours for all dates within the window in a given year, and divided the number of Golden Eagles observed by the number of observation hours to derive the mean Golden Eagle passage rate for each site in each year. I used the same "window of possibility" dates to calculate the passage rate for the Antrim Wind project data using migration survey data provided by the applicant.

Q. The Draft Eagle Conservation Plan Guidance issued by the U.S. Fish & Wildlife Service in January 2011 describes four categories for proposed projects based on their risk to eagles: Category 1 – High risk to eagles/potential to avoid or mitigate impacts is low, Category 2 - High to moderate risk to eagles/opportunity to mitigate impacts, Category 3 – Minimal risk to eagles, and Category 4 – Uncertain risk to eagles (http://www.fws.gov/northeast/EcologicalServices/eagle.html). In your opinion, which category applies to the project area?

A. In my opinion, the proposed project is in Category 2 with respect to Golden Eagles, which means that as currently sited and planned, it is reasonably likely to take eagles at a rate greater than is consistent with maintaining stable or increasing populations, but the risk might be

minimized to the maximum degree achievable through a combination of conservation measures and reasonable compensatory mitigation, per an effective and verifiable Eagle Conservation Plan.

Q. What is the potential for operational mitigation to minimize the risk of Golden Eagle collision mortality at this site?

A. The work of Lanzone et al. (2012) suggests that it is possible to identify times when Golden Eagles would be expected to use orographic lift at a given location. Conducting the necessary analysis to determine these conditions for the project area and adopting a policy of operational curtailment when those conditions exist during daylight hours of Golden Eagle migration periods could minimize the risk of collision mortality at this site.

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