# Wind & Wildlife

Photo Credit: EDP Renewables. Lewis County, NY

All large scale electricity production has an impact on wildlife. Electricity from wind turbines is no exception. However, different types of electricity generation impact wildlife in different ways, so it is important to consider wind's wildlife impacts within the context of all forms of electricity generation. Compared to other forms of electricity generation, wind power poses the lowest collective risk for potential harm to wildlife.[1] Additionally, the benefits to wildlife from decreased fossil fuel emissions, a result of replacing fossil fuel-generated electricity with wind-generated electricity on the electric grid, must also be considered.

Burning fossil fuels, such as coal, oil and natural gas, is considered the conventional means for generating electricity. However, emissions from fossil fuels combustion threaten wildlife with mercury poisoning, acid rain, changing habitats due to global warming, and diverse impacts from mining, drilling, and other fuel extraction activities.[2] Nuclear power, while it does not contribute to acid rain or global warming, is prone to releases of radioactive steam,[3] and can also harm fish and other aquatic life through water intake and thermal discharge.[4] The storage of radioactive waste also poses a threat to wildlife due to the potential for toxic contamination and destruction of habitat.[5]

As an example of the relative impacts of various types of electricity generation, U.S. fossil fuel power plants were responsible for 14.5 million bird deaths in 2006. The same year, U.S. nuclear plants killed 327,000 birds, while U.S. wind generation killed approximately 7,000.[6]

In 2009, NYSERDA conducted a study comparing the wildlife impacts of all major electricity generation tech-

1. NYSERDA. 2009. *Comparison of Reported Effects and Risks to Vertebrate Wildlife from Six Electricity Generation Types in the New York/New England Region,* http://www.nyserda.org/publications/Report%2009-02%20Wildlife%20report%20-%20web.pdf
2. U.S. Environmental Protection Agency. 2010. *Electricity from Nuclear Energy*. U.S. EPA http://www.epa.gov/cleanenergy/energy-and-you/affect/nuclear.html
3. U.S. Nuclear Regulatory Commission, Title 10, Code of Federal Regulations, part 20.1301
4. New York State Department of Environmental Conservation, "Best Technology Available for Cooling Water Intake Structures ," draft policy from March 4, 2010. http://www.dec.ny.gov/docs/fish_marine_pdf/drbtapolicy1.pdf
5. U.S. Environmental Protection Agency. 2010. *Electricity from Nuclear Energy*. U.S. EPA http://www.epa.gov/cleanenergy/energy-and-you/affect/nuclear.html
6. Sovacool, Benjamin K. 2009. "Contextualizing avian mortality: A preliminary appraisal of bird and bat fatalities from wind, fossil-fuel, and nuclear electricity" Energy Policy 37 2241–2248

nologies used in New York State, considering the entire life cycle of each fuel. The table below shows the results of this study, which concluded that wind energy poses the least risk to wildlife of all the generation types studied.[7]

**Table 1: The Potential Highest Levels of Relative Wildlife Risks for Each Life Cycle Stage of Each Electricity Generation Source.**

| Source | Resource Extraction | Fuel Transportation | Construction of Facility | Power Generation | Transmission and Delivery | Decommissioning of Facility |
|---|---|---|---|---|---|---|
| Coal | Highest Potential | Lower Potential | Lower Potential | Highest Potential | Moderate Potential | Lower Potential |
| Oil | Higher Potential | Highest Potential | Lower Potential | Higher Potential | Moderate Potential | Lower Potential |
| Natural Gas | Higher Potential | Moderate Potential | Lowest Potential | Moderate Potential | Moderate Potential | Lowest Potential |
| Nuclear | Highest Potential | Lowest Potential | Lowest Potential | Moderate Potential | Moderate Potential | Lowest Potential |
| Hydro | None | None | Highest Potential | Moderate Potential | Moderate Potential | Higher Potential |
| Wind | None | None | Lowest Potential | Moderate Potential | Moderate Potential | Lowest Potential |

**Source: NYSERDA**

Although the impact to wildlife of wind electricity generation is less than that of fossil fuel-based generation, most wind developers are required to make efforts to limit the impacts of the turbines they install. In New York State, proposed wind farms of 25 MW or greater capacity are subject to a required environmental assessment as part of the state siting process established under the new Article X. Wind farms of capacity less than 25 MW are still permitted at the local municipal level; towns control local land use through zoning and permitting processes, can require wind developers to avoid sensitive habitats or bird and bat flyways, and generally serve as lead agency in the State Environmental Quality Review Act (SEQRA) process, which requires detailed environmental impact studies. Furthermore, wind power facilities are subject to three important federal environmental laws: the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Endangered Species Act.[8]

## BIRDS

Current studies demonstrate that modern wind turbines have little impact on birds relative to other human-introduced threats. The National Academy of Sciences estimated that wind energy is responsible for less than .003% (3 of every 100,000) of bird deaths caused by human activities and domestic cats. Advancing research on turbine placement and design may be able to further minimize impacts to birds. Already, in contrast to earlier

7. NYSERDA. 2009.
8. United States Government Accountability Office. September 2005. *Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife*, http://www.gao.gov/new.items/d05906.pdf

designs, modern turbines are designed with a sleek monopole tower to discourage birds from perching or nesting.[9] The newer turbines, which are on towers of 200 to 260 feet, are less fatal to raptors than earlier models that were on towers of 60 to 80 feet.[10] Research shows that wind turbines are relatively low in bird collision impacts compared to other structures, as shown in Table 2.[11]

**Table 2: Relative Annual Bird Mortality Associated With Common Structures in the U.S.**

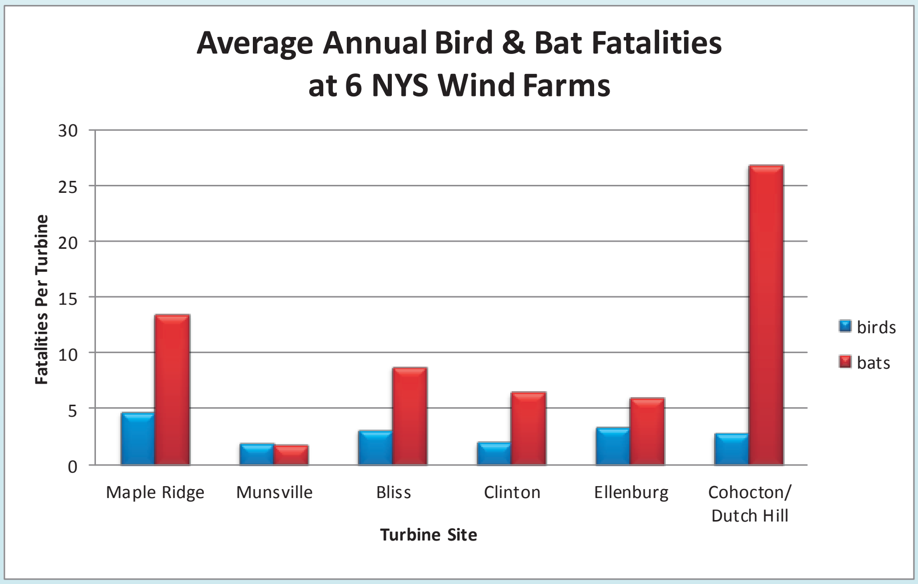
| Structure | Wind Turbines | Communication Towers | Vehicles | Power Lines | Buildings |
|---|---|---|---|---|---|
| Bird Mortality/ Year | 10,000 - 40,000 | 4 million - 50 million | 60 million - 80 million | Tens of thousands - 174 million | 98 million - 980 million |

**Source: National Wind Coordinating Committee**

## BATS

Bat fatalities have been reported at nearly all wind farms in the U.S. The rate of mortality averages 0 to 4.3 bats per turbine per year, excluding Appalachian regions where mortality rates for bats were much higher and in some cases reached 300 deaths per turbine per year.[12] A recent study by the New York State Department of Environmental Conservation showed that bat mortality exceeded bird mortality by more than 200% at six New York State wind farms where bird and bat mortality counts were taken over a seven-month period, as shown in the chart below.[13]

A substantial portion of bat fatalities occur during periods of low wind conditions, and most occur during the bat migration period from summer to fall.[14] The reasons bats are attracted to turbines are not fully understood, but by controlling for a variety of factors, it does seem to be possible to decrease the number of fatalities from bat-turbine collisions. Some recent studies have shown that raising the "cut-in" speed of turbines (the wind speed at which the turbines begin to turn and generate power) during the summer and fall can reduce bat mortality from 44% to 93% while reducing energy generation only 1% or less.[15] This operational mitigation strategy seems to be effective because bats tend to fly more during low-wind conditions, and less when winds are stronger.




Data Source: New York State Department of Environmental Conservation
Graph: Citizens Campaign for the Environment

9. Kuvlesky, William P., Brennan, Leonard A., Morrison, Michael L. et.al. 2007. *Wind Energy Development and Wildlife Conservation: Challenges and Opportunities* Journal of Wildlife Management (Nov 2007) : Vol. 71, Issue 8, p. 2487-2498
10. United States Government Accountability Office. September 2005.
11. Erickson, Wallace., Johnson, Gregory., Strickland, M. "Avian Collisions with Wind Turbines" *National Wind Coordinating Committee (NWCC)*, 2001, http://www.west-inc.com/reports/avian_collisions.pdf
12. United States Government Accountability Office. September 2005.
13. New York State Department of Environmental Conservation, 2010. *Post Construction Mortality Summary for NY Wind Energy Projects.*
14. Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, T. H. Henry, G. D. Johnson, J. Kerns, R. R. Kolford, C. P. Nicholson, T. O"Connell, M. Piorkowski, and R. Tankersley, Jr., "Patterns of fatality of bats at wind energy facilities in North America," *Journal of Wildlife Management*, (2008) 72: 61–78.
15. Arnett E.B., Huso,, M., Schirmacher, M.R., and Hayes, J.P. 2008. "Altering turbine speed reduced bat mortality at wind-energy facilities," *Front Ecol Environ* (2010) doi:10.1890/100103

## OFFSHORE WIND AND WILDLIFE

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Birds can collide with offshore wind turbines in oceans or lakes just as they can with turbines on land. Although there are no operating offshore wind farms as yet in the U.S., the experience of European offshore wind farm developers and operators suggests that, as on land, bird collisions can be minimized by keeping offshore wind turbines out of critical habitats and migratory flyways.

The potential for fish and larger marine mammals to be adversely affected by turbine construction is difficult to measure, and there are few studies on this question. Observations using infrared video monitoring have shown that avoidance responses to underwater turbine support structures vary from species to species.[16] There is also some evidence that offshore wind turbine bases, which anchor the towers to the lake or ocean floor, can create new aquatic habitats; the bases of the turbines can increase habitat heterogeneity by adding hard bottom structures to an environmental previously consisting of sandy sediments, thereby increasing biomass at the turbine sites.[17] The impact of increased biodiversity due to the addition of built structures is not clear.

More research is needed before we can fully understand the potential impacts of offshore wind turbines on birds and other offshore wildlife. Researchers continue to monitor the long-term changes in marine communities surrounding turbines due to these changes.[18]

## METHODS TO REDUCE COLLISIONS

Comprehensive bird and bat studies performed both pre- and post-construction are designed to help developers better understand and potentially mitigate the risk of impacts to wildlife. Requiring wind power developers to compile bird and bat data and migration patterns prior to planning a wind energy project may help in avoiding unnecessary fatalities. Once turbines are constructed, site-specific monitoring of turbines enables researchers to adopt management practices to reduce incidents of collision between birds and bats and the turbines. For example, if post-construction monitoring reveals wildlife impacts are of significant concern, slowing down or turning off turbines during low wind periods and times of essential migration may reduce bat fatalities.[19] Electromagnetic signals can act as a deterrent to some foraging bats, and this technology is being explored to deter bats from approaching active land based turbines.[20] As with all large structures, the best available technology should be implemented at wind farms to reduce wildlife impacts.

16. Vattenfall, Dong Energy, Danish Energy Authority. November, 2006. "*Danish Offshore Wind – Key Environmental Issues,*" *http://193.88.185.141/Graphics/Publikationer/Havvindmoeller/havvindmoellebog_nov_2006_skrm.pdf*
17. Vattenfall, et al, 2006
18. Vattenfall, et al, 2006
19. Arnett et al., 2008
20. Nicholls, B. and Racey, P., "The Aversive Effect Of Electromagnetic Radiation On Foraging Bats: A Possible Means Of Discouraging Bats From Approaching Wind Turbines," (2009). *Plos One*, 4(7), e6246, http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0006246

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