firstwind℠
CLEAN ENERGY. MADE HERE.

October 18, 2013

Dan Courtemanch
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333

Subject: Bingham Wind Project, Response to Environmental Project Review Comments from Maine Department of Inland Fisheries and Wildlife
Project # L-25973-24-A-N / L-25973-TG-B-N

Dear Dan,

Below is our response to the new Maine Department of Inland Fisheries and Wildlife (MDIFW) curtailment guidance. In addition to these comments, we appreciate the challenges associated with the Maine Department of Environmental Protection (MDEP) setting policy on curtailment and think it would be helpful if MDEP were provided with a comprehensive overview of our experience with curtailment, including in Maine, Hawaii, and Vermont. First Wind would be happy to meet with MDEP to provide an overview of the literature and results from our operating projects and to discuss the issues and intricacies associated with curtailment.

We were surprised and disappointed by MDIFW's recommendation to increase the cut-in speed from 5.0 m/s to 6.0 m/s at this late stage of their review. First Wind and its wildlife experts have been in regular consultation with MDIFW about this project since 2010 and as recently as late September, 2013, and bat curtailment has been discussed at length, but the concept of raising the restrictions even further was never discussed. The duration of the 5.0 m/s cut-in scenario proposed in our application is very conservative, reflected the latest guidance from MDIFW, and follows what has been required on other recent projects. As we have stated previously in our application and follow-up materials, we do not believe that the best available science supports this level of curtailment; nonetheless First Wind believes it is appropriate to work cooperatively with the review agencies to develop a curtailment scenario that is appropriately conservative but also reflects the level of risk presented by the project.

Had we been aware of MDIFW's intention to recommend a 6.0 m/s cut-in speed in their latest comments, we would have requested further discussion on the subject. In our view it reopens the question of what constitutes the best strategy for addressing bat impacts at wind farms, in terms of ensuring no undue adverse impact to the affected species and minimizing losses of clean, renewable power generation.

Simply raising the cut-in speed from 5.0 m/s to 6.0 m/s may seem like a small change, but in fact, as proposed by MDIFW, it would approximately *double* the amount of clean, renewable power generation that would be *lost* by the project to curtailment. We believe there are equally effective ways to ensure no undue adverse impact to bats that will result in far less lost power generation.

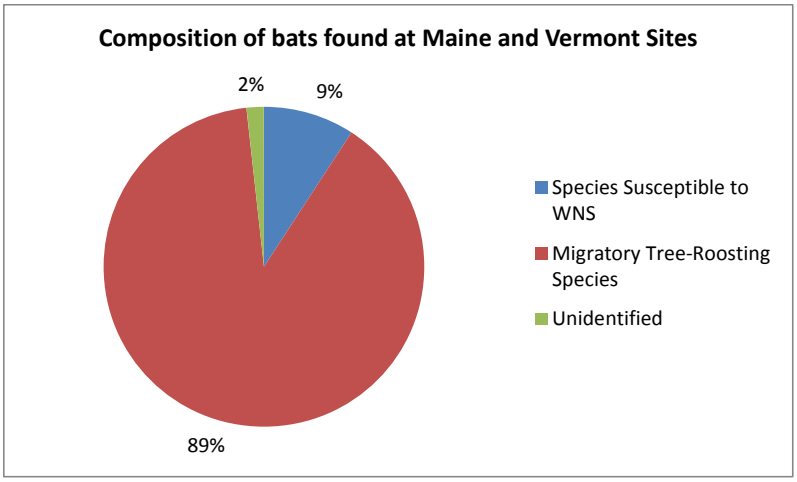
The sole purpose of the Bingham Wind Project is to generate clean, renewable power right here in Maine, using a naturally available resource that is both abundant and pollution-free. Generating power locally from wind reduces our dependence on fossil-fuel (including imported sources of fuel), is in the interest of national security, and helps to reduce carbon emissions that contribute to climate change. It follows that any efforts to mitigate bat impacts should be implemented in a manner that provides the greatest benefit to bats, while minimizing losses of

wind power generation. This is consistent with the requirements of LD 385 to provide "best practical mitigation," taking into account both the effectiveness of the methods and the economic feasibility of the proposed mitigation.

We share MDIFW's concerns about the devastating effects of White-Nose Syndrome (WNS) on populations of cave-hibernating bats in Maine. Bat mortality from wind projects, particularly in Maine, however, is associated primarily with species that are not affected by WNS. A strategy of curtailment that is overly broad will result in unnecessary levels of curtailment that will not result in any meaningful reduction of risks to bat species affected by WNS.

Of the eight species of bats that are known to occur in Maine, three are considered migratory "tree-roosting" species, and include the Hoary bat, Silver-haired bat, and Eastern red bat. These species account for over 75% of bat fatalities at wind farms in the eastern United States (Johnson 2005, Arnett et al. 2008, Cryan and Barclay 2009, Arnett and Baerwald 2013). Importantly, these species are not affected by WNS.

The species affected by WNS are primarily resident species of the genus *Myotis* that do not migrate, but overwinter by hibernating locally. These species account for a relatively small percentage of bat fatalities at wind farms in the U.S. and, as noted by MDIFW and others, their populations are threatened by WNS, not by wind turbines. As the chart below depicts, data from over six years of mortality studies at operating wind farms in Maine and Vermont indicate that less than 10% of the bats found are of species that are susceptible to WNS. Notably, none of the documented fatalities have been northern long-eared bats, the species proposed for listing by USFWS.



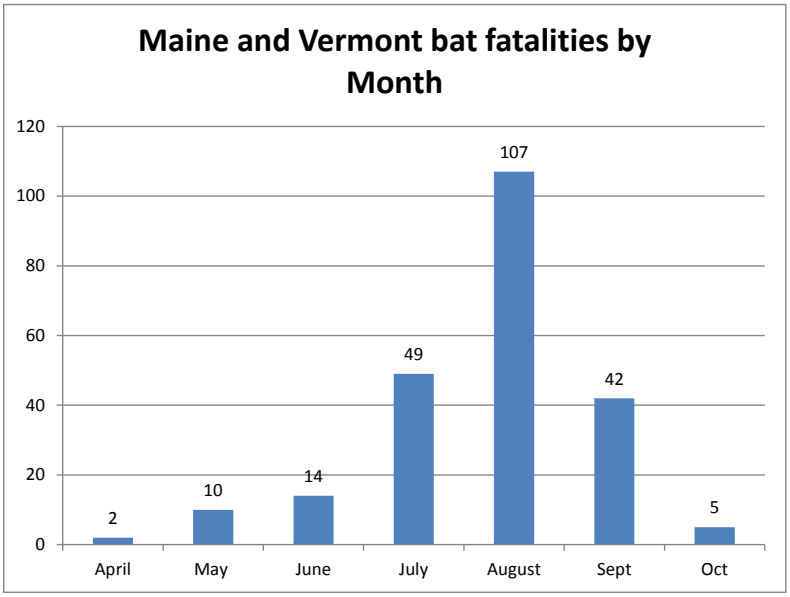
Studies have shown that bat fatalities can be significantly reduced by raising the threshold at which turbine blades start to rotate, i.e., by raising the cut-in wind speed. The Vestas and Siemens turbines proposed for Bingham have a manufacturer's cut-in wind speed of 3.0 m/s. Under previous guidance from MDIFW, the cut-in speed would have been raised from 3.0 m/s to 5.0 m/s from one half hour before sunset to one half hour after sunrise between April 20 and October 15. This represents a loss of approximately 8,400 megawatt hours (MWh/yr) of generation annually, enough to power approximately 1,350 average Maine homes, and thus represents a significant loss of renewable power for the State of Maine. Raising the cut-in speed from 5.0 m/s to

6.0 m/s would nearly double this loss to approximately 15,500 MWh/yr or roughly enough energy to power 2,500 homes annually.

Cut-in speed is only one component of a curtailment plan - it needs to be considered in the context of other factors that correlate with bat activity, including *seasonality* (i.e., months of curtailment) and factors such as *temperature*. We know that migratory species comprise the majority of bat fatalities and that bat mortality rates are consequently very seasonal (August – September being the peak). We also know that bat activity is related not only to wind speed but also temperature and precipitation. Imposing an overly broad curtailment requirement for mid-April through mid-October ignores what we know about seasonality of bat mortality, and does not take advantage of the ability to design a curtailment system incorporating multiple weather variables. In other words, if the objective is to minimize the risk of collisions, then curtailment should be implemented during periods when bat fatalities are known to occur.

Seasonality and Temperature

Approximately 86% of bat fatalities documented at facilities in Maine and Vermont have occurred between July 1 and September 30, which corresponds with the post-breeding dispersal and fall migration periods for tree-roosting species. Based on the species composition of fatalities found to-date, of the few fatalities that occur outside this period, only a small percentage are species susceptible to WNS. Thus, requiring curtailment outside this period holds little potential for benefitting bats in general, or WNS species in particular. The reports documenting these fatalities have been submitted to the respective state wildlife agencies over the past seven years.



Our Sheffield Wind Project in northeast Vermont has been the subject of intensive research into the effects of wind energy on bats over the past two years. This research has been a cooperative effort between First Wind, the Vermont Agency of Natural Resources (ANR), U. S. Fish and Wildlife Service (USFWS), Bat Conservation International (BCI), and Texas Tech University. Monitoring includes daily, intensive searches of wind turbines to document bat fatalities. During two years of fatality surveys at the Sheffield Wind Project 100%

of all bat fatalities have been tree-roosting species. Approximately 87% of these fatalities occurred between the dates of July 1 and September 30.

In addition to wind speed, parameters such as rain and air temperature have been shown to affect bat activity and can be used to further "tailor" mitigation to achieve the greatest benefit with less unnecessary loss of energy production. For example, as noted by MDIFW, the Sheffield project in Vermont is currently operating with a 6.0 m/s cut-in speed to limit bat fatalities. However, the 6.0 m/s cut-in speed has only been stipulated on nights between June 1 and September 30, and only when air temperatures are above 49 deg F. Previously agreed-upon curtailment strategies at other First Wind projects in Maine (e.g., Bull Hill and Oakfield) also include temperature thresholds for curtailment.

Further, the 6.0 m/s cut-in speed is stipulated as a *maximum* at Sheffield. It is intended to set an upper limit, and it can be adjusted downward based on the best available science. Similarly, the curtailment season may also be shortened based on the results of the curtailment study at Sheffield. The use of 6.0 m/s is also *not* a standard in Vermont. Two operating wind facilities in Vermont are currently conducting studies to assess the relative benefits of curtailment at 5.0 m/s and 6.0 m/s. Results from those studies will be used to set recommendations for wind sites in the state.

In our view, an appropriate curtailment strategy needs to optimize curtailment to include periods when the greatest percentages of fatalities have occurred, and exclude periods when fatalities are relatively infrequent. Based on surveys of Maine and Vermont projects over the last seven years, a curtailment period of July 1 – September 30 would encompass the period when approximately 86% of bat fatalities have been documented, including fatalities of species affected by WNS. Limiting curtailment to this period would ensure no undue adverse impacts to bats and avoid unnecessary loss of renewable generation. Further, including a temperature threshold of 49 deg F would allow turbines to operate during periods when bat activity is minimal during summer months.

Cut-In Speed

The physics of wind energy dictate that power generation increases exponentially with wind speed. Accordingly, the generation of clean, renewable power is exponentially *lost* when the cut-in speed is raised. For example, raising the cut-in speed from the 5.0 m/s threshold previously recommended by MDIFW to 6.0 m/s for the entire April 20 – October 15 period would result in an additional incremental loss of approximately 7,100 MWh of energy per year generated by the Bingham project. This single, 1.0 m/s change nearly doubles the energy loss over the original increase from 3.0 to 5.0 m/s. This not only represents a substantial loss of clean, renewable power, but this power will need to be replaced by the combustion of fossil fuels with their attendant air emissions. It is our view that a large portion of this power does not need to be sacrificed, but can be retained by tailoring curtailment, without materially increasing risk to bats.

MDIFW's recommendations are somewhat arbitrary, as there is no conclusive evidence that the increase from 5.0 to 6.0 m/s will materially reduce bat mortality. Curtailment at 4.5 and 5.0 m/s has been shown to reduce bat mortality by substantial margins in ongoing studies, so it is by no means a given that incrementally increasing the cut-in speed from 5.0 to 6.0 m/s will yield additional significant reductions in fatalities. What is assured is that it will yield significant reductions in power production. Bat Conservation International (BCI) recently published a summary of studies that tested the effectiveness of different curtailment strategies at reducing bat fatalities at 10 wind facilities in North America (Arnett et al. 2013). Five studies looked at bat fatalities at turbines with cut-in speeds of 5.0 m/s and higher, however none evaluated the incremental benefit of raising the cut-in speed from 5.0 m/s to 6.0 m/s. In most cases the greatest percentage reductions in bat fatalities were achieved by raising the cut-in speed from "normal" (3.0, 3.5, or 4.0 m/s) to 4.5 or 5.0 m/s. In at least one case the

greatest percentage of reductions occurred simply by feathering blades below the normal cut-in speed, without any curtailment whatsoever (Baerwald et al., 2009).

Where incremental reductions in bat fatalities have been observed above 5.0 m/s they are significantly smaller than the reductions achieved at 5.0 m/s. In other words, there is a diminishing benefit with each incremental increase in the cut-in speed, while at the same time there is an exponential increase in power lost. As noted above, these reductions were almost entirely related to tree-roosting migrants, not the species whose populations are being decimated by WNS.

An Appropriate Balance

As stated in BCI's recently published synthesis, one of their objectives was to identify ways to, *"…optimize operational mitigation so as to reduce economic costs while maintaining effectiveness of mitigation…*" (Arnett et al. 2013). According to BCI, *"…a substantial portion of bat fatalities occur during relatively low-wind conditions during the late summer-fall bat migration period…",* and *"…Bats significantly reduce their flight activity during periods of rain, low temperatures, and strong winds … and are less at risk to collision with wind turbines under these conditions…".* In other words, a balance can be struck between reducing risk for bats and allowing renewable power to be generated.

In Maine, winds are lower in the late summer/early fall, which coincides with the well-documented timing of bat migration and higher bat fatality rates. Focusing curtailment during this period is not only protective of bats, but minimizes the loss of renewable power generation.

Simply put, the curtailment parameters of 6.0 m/s from April 20 – October 15 proposed by MDIFW are overly broad and do not balance the protection of bats with minimizing losses of renewable energy generation. Studies have shown that risk to bats is extremely low and curtailment is unnecessary during much of the period that IFW proposes. As an alternative to MDIFW's proposed criteria, we suggest the following curtailment parameters as optimal for reducing the risk of bat collisions with wind turbines, while minimizing the loss of renewable power:

i. 5.0 m/s from July 1 to September 30
ii. A temperature threshold of 49 deg F
iii. Curtailment from sunset to sunrise

Given the small numbers of bat fatalities that occur before July 1 and after September 30, curtailment during these periods does not represent the best practical approach to reducing bat fatalities (including species affected by WNS) during these periods. Efforts to address WNS should be focused where they can have the greatest benefit. These may include such measures as protection of hibernacula, as is being done under a Vermont ANR program that is partially funded by wind energy companies. First Wind would be very willing to work cooperatively with MDIFW and others to identify and support similar efforts to combat the devastating effects of WNS on Maine bat populations.

Sincerely,

Robert Roy

Dave Cowan

Manager, Ecological Services
First Wind Energy, LLC

Vice President, Environmental Affairs
First Wind Energy, LLC

Literature Cited:

Arnett, E.B. and E.F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Pp. 435 – 456 in: Adams, R.A., and Pedersen, S.C. eds. Bat Evolution, Ecology, and Conservation. Springer, New York, 547pp.

Arnett, E.B., G.D. Johnson, W.P. Erickson, and C.D. Hein. 2013. A synthesis of operational Mitigation studies to reduce bat fatalities at wind energy facilities in North America. A report submitted to the National Renewable Energy Laboratory. Bat Conservation International. Austin, Texas, USA.

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. Tankerslery, Jr. 2008. Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72:61-78.

Baerwald, E.F., J. Edworthy, M. Holder, and R.M.R. Barclay. 2009. A Large-Scale Mitigation Experiment to Reduce Bat Fatalities at Wind Energy Facilities. Journal of Wildlife Management 73:1077–1081.

Cryan, P.M. and R.M.R. Barclay. 2009. Causes of bat fatalities at wind turbines: Hypotheses and Predictions. Journal of Mammalogy 90:1330-1340.

Johnson, G.D. 2005. A review of bat mortality at wind-energy developments in the United States. Bat Research News 46: 45-49.