Impact of New Wind Technology on Bird and Bat Population

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September 5th 2014

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Abstract

There are many new renewable technologies on the market today. These technologies provide an alternative solution to fossil fuel, and the reduction of Hazardous Air Pollutants (HAP's). There is now a new wind technology, which captures this abundant resource, without using traditional 'turbine' methods. The vulnerability of birds and bats being killed by the large traditional wind turbines has been in discussion for many years. Wind energy is one of the fastest growing emerging markets, in terms of research and development (Kunz et al. 2007). This study aims to underline the impact of the old wind technology comparative to the Regenedyne technology on the bird and bat population as measured in the United States.

Introduction

One of the fastest growing alternative energy technologies is wind ***technology***. While wind-generated electricity is renewable and generally considered environmentally clean, it has had its difficulties. One such challenge is its negative impact on the bird and bat population in some areas. Fatalities of bats and birds have been recorded at wind facilities worldwide (Erickson et al. 2002, Durr and Bach 2004, Kunz et al. 2007, Arnett et al. 2008, Baerwald 2008). Bat fatalities at wind energy facilities generally received little attention in North America until 2003 when 1,400–4,000 bats were estimated killed at the Mountaineer Wind Energy Center in West Virginia (Kerns & Kerlinger 2004). High bat fatalities continued at the Mountaineer facility in 2004 and large kills also have been reported at facilities in Pennsylvania (Arnett 2005) and Tennessee (Fiedler 2004, Fiedler et al. 2007). These fatalities raised concerns about potential impacts on bat populations at a time when many species of bats are known, or suspected, to be in decline (Racey & Entwistle 2003, Winhold et al. 2008). Moreover, the extensive planning and development of both onshore and offshore wind energy development is increasing worldwide (EIA 2008, Arnett et al. 2007a, Kunz et al. 2007), raising the need to better address this issue.

Discussion

There has been a rapid evolution of wind-turbine design over the 25 years. Thus, modern turbines are different in some ways from the turbines that were originally installed in California's three large installations at Altamont Pass, Tehachapi, and San Gorgonio (Palm Springs). A typical modern generator consists of a pylon about 60 to 90 meters (m) high with a three-bladed rotor about 70 to 90 m in diameter mounted atop it (Figure.1). Larger blades and taller towers are becoming more common. Other support facilities usually include relatively small individual buildings and a substation (CEIWE Projects 2007).

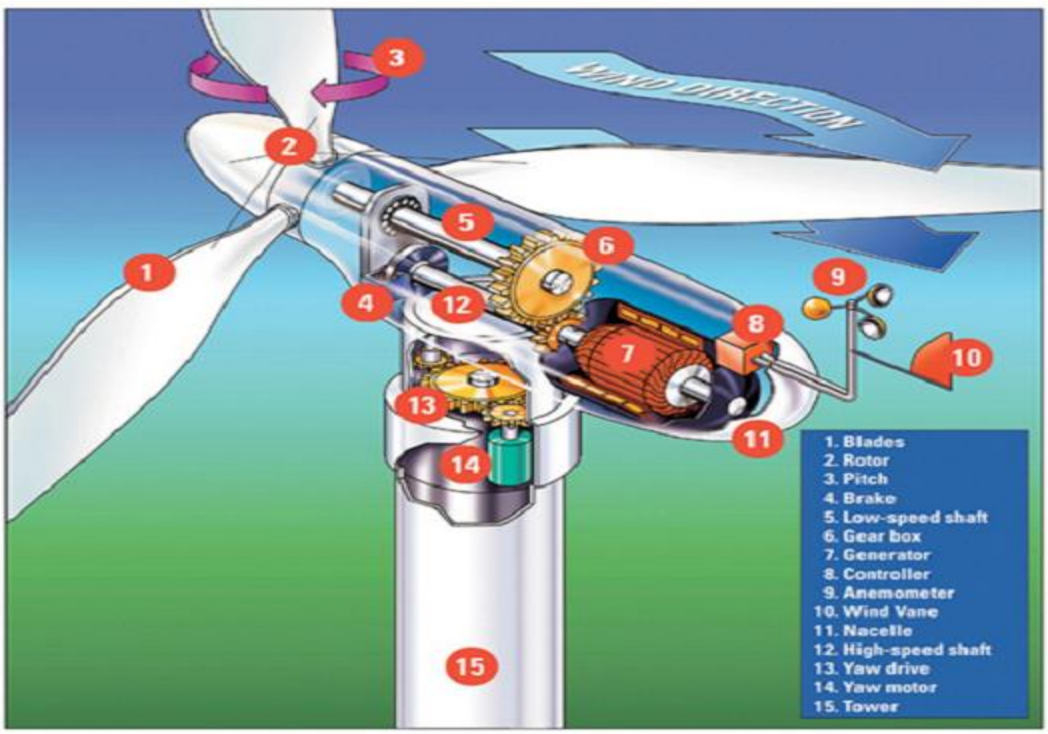

Figure.1: Structure of a wind turbine. **Source**: Alliant Energy 2007. Reprinted with permission; copyright 2007, Alliant Energy.

From an ***engineering*** and ***design*** perspective; Regenedyne's proposed new technology is not based on generating energy in the same way as does a traditional wind turbine, but offers an alternative to generating energy with a smaller footprint and even using existing buildings to act as the towers, creating more consistent wind power with a smaller footprint and no protruding blades. Current, or traditional, wind turbine technology is based on a design similar to windmills that were developed early in the first century. These designs now include wind turbine blades being produced that measure approximately 120 meters in diameter with prototypes reaching 160 meters. In 2001, an estimated 50 million kilograms of fiberglass laminate were used in wind turbine blades [(1)]. Some of these massive designs have proven to have advantages, such as producing quantifiable amount of energy, but have also offered some serious disadvantages as well: 1. Current wind turbines require large open land to install these gigantic structures, which require massive foundations to support their weight. 2. The expanse of the blade reach alone has been shown to cause fatalities in bids and bats (Arnett et al. 2008; Strickland 2011). 3. Noise nuisance is also a concern; large propellers are mechanically driven by gears, shafts and other moving parts, which make it attractive to birds and bats and other species.

Results from the number of studies reporting collision fatality monitoring at operating wind energy facilities has increased substantially over the years, and approximately 100 studies that were conducted at all seasons are available (e.g., Strickland et al. 2011; Arnett and Baerwald 2013; Loss et al. 2013). There remains much uncertainty as to underlying patterns in collision fatalities in both birds and bats. Some of this uncertainty reflects the lack of data from some regions of the country. For example, we are aware of only one publicly available fatality report from the southwestern U.S., and the northern and eastern regions of the country are underrepresented relative to the Midwest/Prairie region and the Intermountain West. Perhaps this is a result of the location of the majority of wind farms being in the Midwest where the wind is more prevalent. We also do not know whether publicly available reports accurately reflect what is occurring at the majority of facilities from which data are not currently available [(2)]. We can assume that most bird and bat collisions are with the rotating turbine blades (Kingsley and Whittam 2007; Kunz et al. 2007a; Kuvlesky et al. 2007; NAS 2007; Arnett et al. 2008; Strickland et al. 2011). A single facility of three turbines in Tennessee reported approximately 14 bird fatalities per MW per year, but a fatality survey conducted after the facility expanded estimated 1.1 birds per MW per year (e.g., Strickland et al. 2011; Loss et al. 2013). Studies have not found a consistent pattern of fatalities across landscape types: fatality rates can be equally high in agricultural, forested landscapes, or in a matrix of those landscape types (e.g. Jain et al. 2011). Fatality rates average substantially lower at facilities in the western U.S., but, in general, there is greater variation in bat fatalities within regions than among regions (Arnett et al. 2013a; Hein et al. 2013). Collisions of small songbirds (<31 cm in length) account for approximately 60% of fatalities at U.S. wind facilities (Loss et al. 2013); small songbirds comprise more than 90% of all land birds (Partners in Flight Science Committee 2013). Most songbird species are migratory resulting in spring and fall peaks of bird casualty rates at most wind facilities (Strickland et al. 2011). Numbers of raptor fatalities appear to be declining as a result of the repowering at Altamont; smaller low-capacity turbines are being replaced with taller, higher-capacity turbines (Smallwood and Karas 2009). Larger turbines have fewer rotations per minute, and this difference may be partly responsible for the lower raptor collision rates (NAS 2007). Regardless of the inconsistency of the fatality data, we can conclude that there is a fatality issue with the current, or traditional, wind turbine technology, the specific extent of which must be concluded in a separate study.

Comparing and Contrasting Conventional Wind turbines

The technology being introduced offers several advantages versus the current wind turbine technology. We analyzed several studies, and our conclusion is as follows:

- The Regenedyne unit has vertical axis wind turbine blades.
- No moving parts, slow speeds or large foundations required.
- The length of the current blades ranges from 40 to 90 meters.
- Requires smaller amount of space, or even installed on top of buildings, for similar energy production, specifics of which are the subject of other studies. Smaller space for concern should reduce fatalities.
- Birds and Bats mortality would decrease significantly.
- It appears possible that birds and bats might use the entrance and the rear of the Regenedyne equipment unit as a shelter from storms or shelter during winter months if there was no rotation of rotors. This would need a location-specific analysis.

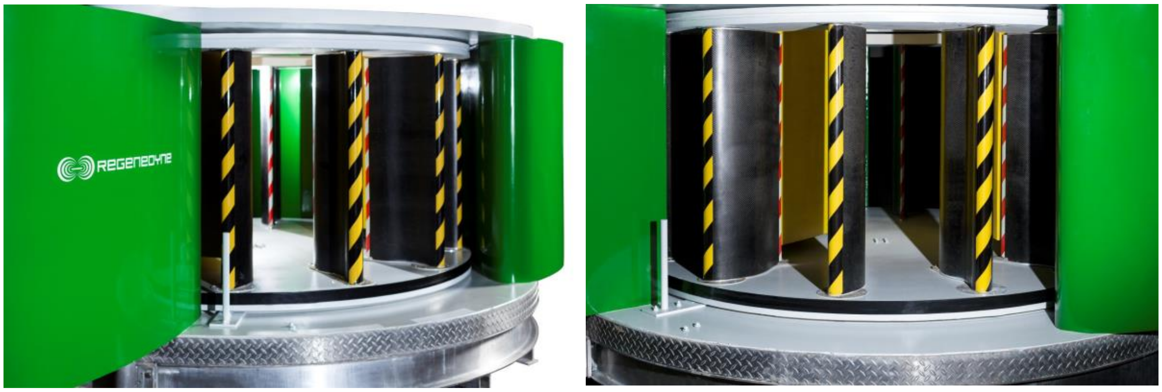

Figure. 2 Source**:** Regenedyne LLC 2014

Conclusion

This paper tries to briefly generate a broad picture of the real impact of the wind technology on the life of the birds and bats. Despite the environmental benefits and potential risk of two technologies, the Maglev concept is well considered on term of saving lives of the fauna; it represents the lowest levels of mortality. However, the turbine wind technology represents the highest levels of mortality on the birds and bats population. It can only be assumed that birds and bats are attracted to the moving propeller turbines and the constant humming noise. Birds and bats are able to see clear sky in their peripheral vision. The fast moving blade coming down would not be concern for the birds or the bats. Regenedyne vertical access blades will cross the aperture frequently and may look more like tree limbs moving which birds and bats would avoid during flying or hovering. Further detailed research is required and it could be conducted by our team to properly understand in deep the disturbance of the technology on the birds and bats.

We believe that when this new equipment is installed and working, a physical inventory can be taken on the mortality of birds and bats compared to the current wind turbine technology, to prove our conclusion. Then we can compare with certainty the accuracy of the new technology data relevant to the traditional wind turbine technology data. With respect to this caveat, we can conclude that the Regenedyne technology should have a significant reduced impact, if any at all on the bird and bat population versus the current installed technology.

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