

Color Bind: A New Study Finds Wind Turbine Color May Play a Role in Bat Fatality Rate

Could purple wind turbines decrease the carnage wreaked in the night by looming towers with spinning blades on Halloween's iconic flying mammals? By Mike Orcutt | Friday, October 29, 2010 | 12 comments

It is clear that wind turbines—the number of which is steadily increasing globally—kill bats. They also kill birds, but studies have consistently shown the Halloween icons to be more prone to death by turbine. The data also indicate that certain species of insectivorous bats, in particular migratory, tree-roosting species, are especially apt to fly into turbines. But exactly why this is remains a mystery.

One theory is that the bats approach the turbines in pursuit of insect prey. Now, a new study suggests that simply changing the color of wind turbines to hues less attractive to insects could reduce the number of bugs that congregate around the turbines, which could in turn reduce bat deaths.

Chloe Long, the lead author of the paper, published in the October issue of the *European Journal of Wildlife Research*, is a PhD student of bioacoustics at Loughborough University in England. Long was studying bat echolocation in the context of wind turbines when she came across a finding in the primary literature that inspired her. "I noticed that a couple had pointed out that insects might be prevalent in areas that have land-based turbines," she says. "The first thing that came to my mind was the possibility that the color of the turbines somehow might be influencing insect activity around them."

Bat fatality studies frequently mention the importance of looking further into the role of insects may play in attracting bats to wind towers. But the question has not been investigated in detail, partly due to the difficulty of designing a controlled experiment. Wind power facility operators are generally resistant to modifications that experiments may impose on equipment and operating schedules, and national and local government regulations for turbine specifications present obstacles. In Long's case, for example, actually painting turbines different colors was out of the question.

Instead the group used rectangular, laminated color cards, each roughly 20 by 30 centimeters and representing one of 10 different colors from a commonly used outdoor paint color system called RAL. They included the two most common colors for outdoor turbines in Europe, "pure white" and "light gray," eight additional RAL colors, from "jet black" to "traffic yellow," and an 11th transparent control card. They laid the cards in a grid pattern at the base of a single 13-meter, three-blade, light gray turbine—the only one in a public parkland meadow that featured an "abundance of local bird and bat activity," according to the paper. Long says: "We chose this site because it is exactly the type of place where you might find insects if they were next to turbines." Testing multiple locations and turbines would have been more advantageous, she acknowledges, but the group was limited to the facility to which they had access.



CLEAN ENERGY TRADE-OFF: The exact reason bats approach deadly wind turbines remains unclear.

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The researchers observed each card for a set period of time, counting the number of insects on or within 10 centimeters of the card. After counting the bugs they moved on to the next card, moving counterclockwise through the grid for 10-minute periods, between which the cards were gathered, cleaned, shuffled and redistributed in a new random grid pattern. The group collected data between the months of June and October—the time of year that corresponds to peak bat activity—for three years. They made 2,012 total insect observations, from 59 10-minute sessions.

Yellow was by far the most attractive color to the insects, perhaps not surprising, given the color's prevalence in flowers. The second and third most attractive shades were the two most common turbine colors, white and light grey. "We weren't expecting that at all," Long says. Additionally, when they analyzed individual color properties outside of the spectrum visible to humans, the researchers found that insects were more attracted to colors that reflect high amounts of infrared or ultraviolet radiation. The card that attracted the least bugs was painted purple.

The results, although preliminary, show it's worth taking a deeper look—not just at turbine color, but also at the general question of whether certain simple modifications to turbines could reduce bat attraction, says Edward Arnett, a conservation scientist at Bat Conservation International. But the problem with jumping to conclusions about insects and turbines, he says, is that the insect attraction hypothesis is still just that—a hypothesis. Bats are clearly drawn to insects, but "I have yet to see convincing evidence that insects are somehow attracted to the facilities or the turbines themselves."

Arnett, who in 2003 founded the Bats and Wind Energy Cooperative, a research group focused on developing solutions to minimize deaths, acknowledges that collecting definitive evidence would be challenging. Most difficult, he says, would be establishing a control site and then replicating results. Further complicating a potential study design is the fact that bat death rates seem to be dependent on wind speed. More occur under low-speed conditions (less than six meters per second), so an experiment comparing two sites would need to account for this. Finally, most of the relevant action happens at dusk or at night, meaning expensive imaging equipment is needed.

A 2008 study that Arnett co-authored was the first to capture video evidence, using thermal imaging, of bats flying around (and into) wind turbines. That same study also found a correlation between observed insect activity and bat activity.

Experiments with real turbines are imperative, Long says, and that prospect that might now be more realistic. The response from scientists—and even a couple advisers to turbine manufacturers—interested in supporting further research has been encouraging, she says. As for purple turbines? "We're not really suggesting that people should go out and paint turbines purple," she says. "Bear in mind, we did only test 11 colors, so there are likely to be other colors that need further testing."

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