

## The Owl That Pays the Bills

### How an Owl-Inspired Wind Turbine Upgrade Quietly Prints Money

Somewhere in a field in Northern Germany, a 160m rotor wind turbine is doing something slightly subversive. At night, when many other operators must throttle their turbines down into so-called “noise reduced modes,” this one continues to run in normal mode. The only difference are the different looking serrations on each blade’s trailing edge, looking more like snake tongues rather than the industry standard sawtooth serrations.

It’s called **FeatherEdge Serration (FES)**, and it lets that turbine earn about €100,000 a year more revenue than one with normal serrations under same conditions — because FeatherEdge is reducing turbine noise with the same effect which is used by the feathers of an owl.

#### The world’s most expensive whisper

In densely populated Germany, nighttime turbine noise at neighbouring houses is limited by law to 35 to 45dB(A). To stay under that line, operators have to do something painful: they noise and power reduce their turbines down at night. Every decibel of noise reduction costs about **3% of energy production**. Stack a few dB, and curtailment losses can climb above **15% of the nighttime output**. A quarter of the wind farm’s reason for existing, gone — every night. Hoare Lea, the British acoustics consultancy, notes that differences of just 2–3 dB — barely audible to a human — can swing wind farm capacity by up to 40%.

#### What an owl knows that engineers didn’t

Owls are highly successful at hunting mice with excellent hearing and a silent approach, so evolution has shaved the noise off their flight. The trick lies partially in their soft, flexible feathers that let air slip off the wings smoothly. The wind industry’s first response were stiff plastic saw-tooth serrations attached to the trailing edges at the outer third of the rotor blades. They work, knocking about 1.5 - 2 dB off the source. It has become industry standard over the last 15–20 years.

But a saw-tooth is to an owl feather what a butter knife is to a sushi chef — directionally correct, but missing every detail that matters. FeatherEdge is what happens when engineers properly copy the owls feather: long, flexible, double-tipped tongues of highly engineered materials, adjusting to turbulence running across the blade and reducing flow disconnections. In addition, the owl’s wing uses destructive interference. Air from both sides of



FeatherEdge lets a turbine earn about €100,000 a year more revenue than one with normal serrations under the same conditions: by reducing turbine noise with the same effect that owl feathers have.

the owl’s wing mixes at different points along the trailing edge so that a part of the noise from these two points is cancelling out. FeatherEdge matches this: It’s like noise-cancelling headphones for wind turbines.

#### The case that converts the skeptics

An **Enercon E-160 E3** 5.56 MW in Germany already fitted with standard saw-tooth serrations was taken as the baseline turbine. Here, the turbine ran full power during the day and was throttled to Mode IVs at night to keep the receptor at the legal 40 dB(A). After the retrofit of FeatherEdge: the source noise drops such that the full-power daytime mode is also quiet enough for nighttime. The throttled mode gets retired. The receptor reading drops from 40 to 38 dB(A). This is because the reduction of FeatherEdge grows with distance as it targets the low-frequency bands below 1000Hz. A recent field campaign showed the benefit is logarithmic with equivalent distance. A win-win solution for the operator and the neighbours.

Nighttime yield jumps 12%. And the new serrations are aerodynamically superior — adding several centimetres of effective chord length on the outer third of the blade, where roughly **80% of the power is generated**. The flexible tongues bend with gusts and turbulence, keeping airflow attached where stiff teeth would stall. TÜV SÜD independently verified an additional **3.41% AEP gain** and a recent side-by-side analysis demonstrated the gains to be likely higher. Annual production climbs from 16.3 to 17.5 million kWh. Multiply 1.2 million extra kWh by €0.085/kWh and the same turbine earns an additional **€102,000 every year**. From a piece of perfectly engineered and optimised serration!

#### The bonus nobody puts on the brochure

Drop a turbine’s source noise by 2–3 dB and setback distances shrink. A developer who couldn’t fit eight turbines on a parcel can suddenly fit ten. It turns projects from unfinanceable to financeable. For a wind farm compliant with noise regulations but still creating noise complaints, FeatherEdge can silence the neighbours in a gentle way. Existing farms find noise budget to repower with bigger machines. This changes what’s possible, not just what’s profitable. The owl figured all this out a few million years ago and now everyone can reap the benefits. ■



Photo: Biome Renewables



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