Case Study: Ice detection with IDD.Blade® – No loss of yield due to unnecessary downtime

Initial Situation

At the Hamwiede wind farm in Lower Saxony, seven wind turbines (WTGs) manufactured by Nordex with a tower height of 91 meters generate a total output of around 16.8 megawatts. The onshore wind farm was taken over by the operator following its commissioning in February 2015. Technical and commercial management has been carried out by BayWa r.e since then. If ice forms on the rotor blades of a wind energy plant, it must be shut down in accordance with official regulations in order to protect the surroundings from ice being shed. Critical ice build-up must therefore be reliably detected using technical measures. A meteorological sensor for ice detection was installed in the Hamwiede wind farm from the very beginning. However, it became apparent already in the first winter that the shutdown due to ice was very imprecise. False alarms and unnecessary shutdowns became more frequent. The potential of the wind farm could therefore not be fully exploited in the particularly high-yield winter months. The result was a considerable loss of yield.

Approach

With a more precise ice detection system with an automatic restart function, these unnecessary yield losses can be avoided. Based on initial calculations, the operator assumed that such a system would pay for itself within two to four years.

In 2016, a first wind turbine was equipped with IDD.Blade from Wölfel for testing purposes. IDD.Blade is a certified and field-tested system for immediate ice detection. Sensors were attached to the rotor blades, which permanently record the natural oscillations of the WTG. The recorded data is in turn evaluated with the help of intelligent algorithms. If the mass of a rotor blade changes due to ice build-up, the vibration behavior also changes. In this way, the actual icing condition of each rotor blade can be recorded individually and precisely. In recent years, the monitoring of the vibration behavior has proven to be a safe and efficient method for ice detection and is much more reliable than an assessment based on meteorological parameters. From the time of installation, ice can be detected precisely both during operation and when the plant is not in operation. If a critical condition is reached, the WTG is automatically shut down. As soon as the plant is ice-
free again, it will also restart fully automatically, according to official safety requirements of public authorities. The downtimes of the relevant wind turbine at the Hamwiede wind farm were significantly reduced in the following winter. As a result, the remaining six turbines were also retrofitted.

“The cooperation between Nordex and Wölfel worked very well in terms of equipment and is proving itself successful in day-to-day practice.”
Michael Rückert, operator

Result

By installing IDD.Blade, the downtimes in the wind farm could be reduced to the times of actual icing. As there is very little real ice formation at the Hamwiede site, the turbines only need to be stopped extremely rarely and the wind farm’s potential can be fully exploited at all times of the year. In addition, the system ensures safety in the immediate vicinity at all times.

“IDD.Blade already exceeded our expectations in the first winter after installation. The system detected ice so precisely that the assumed amortization period was not even reached.”
Michael Rückert, operator

This positive result is also reflected in an economic study on ice detection systems. The investigations show that more than 50 percent of the downtime is unnecessary if systems without automatic restart function are used (source: T. Jung et al.: Wirtschaftlichkeitsstudie von Eiserkennungssysteme an Windenergieanlagen, Weilburg, 2015).