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Smart Sensor Extension

What is the Smart Sensor Extension?
The Smart Sensor Extension is a device that produces a small offset to the blade angles and wind vane. The offset is chosen in such a way that power output is maximised, while damage to the wind turbine is minimised.

Results and financial benefits
A fairly common yaw misalignment (from optimal value) of 8° translates to 2% AEP loss. A blade angle deviation of 2 degrees (from the optimal angle) translates in loss of approximately 6% AEP. Relative blade angle deviations (from optimum) of less than 1 degree can cause major rotor unbalance oscillations that damages the bearings and other mechanical parts.

Figure 1 shows the effect of the Smart Sensor Extension on electrical power output of one specific wind turbine. The additional power was obtained when we adjusted the blade angle offsets (of blades 1, 2 and 3) by -1.2, -0.5, and -0.8 degrees, respectively. The AEP of this particular wind turbine increased by 3%, resulting in a financial yearly benefit of approximately € 12000 EUR.

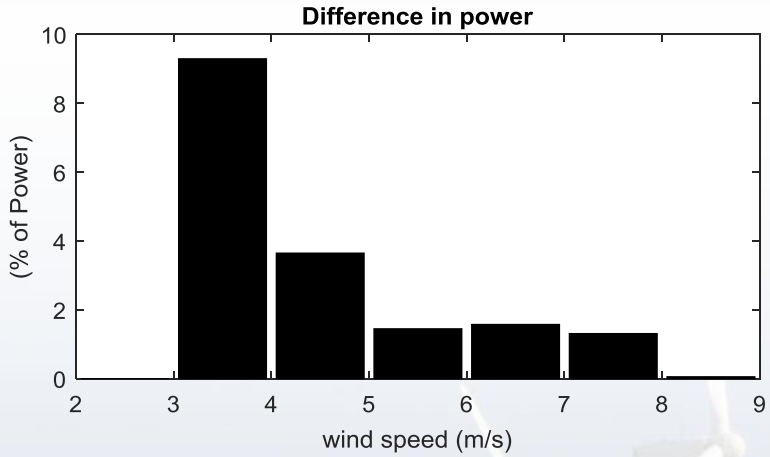

Figure 1 Effect of Smart Sensor Extension on power output

Figure 2 shows the effect (of the blade angle offsets) on the fore-aft acceleration, and side-to-side acceleration. The blue lines show the spectrum with the old blade angle offsets (being 0), and the red lines show the result with the new blade angle offsets. The horizontal axis show the frequency scaled by rated generator speed. The legend in the figure refers to IPC0P settings which corresponds to the optimized blade angle offsets.

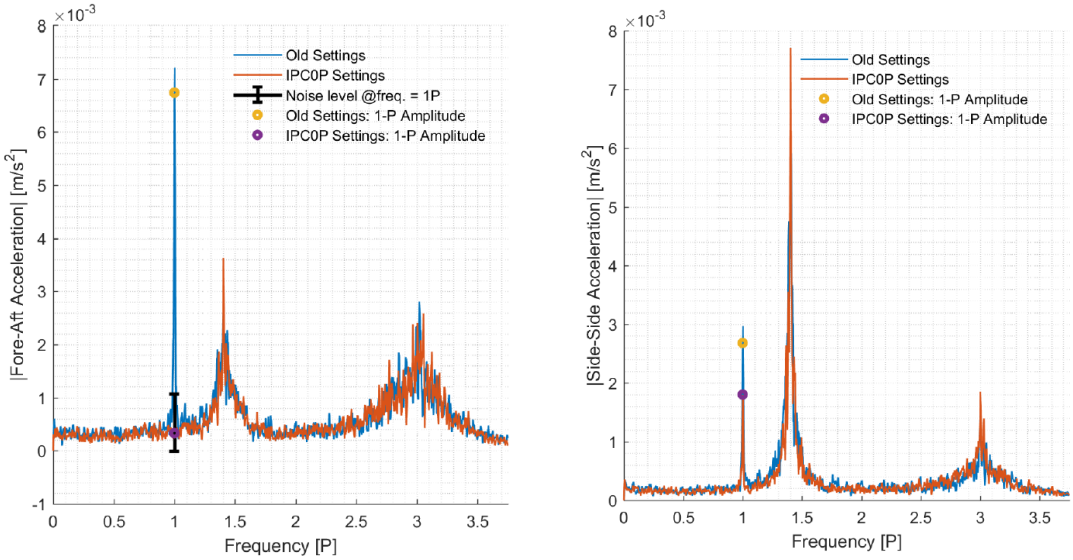

Figure 2 Red lines show effect of the Smart Sensor Extension on fore-aft and side-to-side acceleration (blue lines show results without Smart Sensor Extension)

Implementation of the Smart Sensor Extension

The Smart Sensor Extension can be implemented in any wind turbine. It comes with an interface for the wind turbine owner that shows (on-line) progress, results and status.

Costs, risks and time

DotX pays any costs to implement the device. In return, we ask for 50% of the yearly returns on addition electrical power. On request, other business proposals will be considered.

Implementation takes a few hours only. The device then automatically starts to search for the optimal blade angles which takes approximately 2-4 weeks, depending on the wind conditions and wind turbine type. Finding the optimal wind vane offset takes a similar period of time. After the optimization, there is an evaluation period of a 1-2 months, where the benefits are determined.