



Satellite-image based nacelle north alignment

A fast, reliable, low-cost solution and service for wind farms

Incorrect north alignment of wind turbine nacelles, leading to inaccurate shadow and noise curtailment as well as unreliable side-by-side turbine performance assessments, is an all too common issue in wind farms. As is the cost and effort of performing a manual correction. ENGIE Laborelec now offers a fast and low-cost alignment solution that outperforms traditional methods both in accuracy and efficiency.

THE IMPORTANCE OF NACELLE NORTH ALIGNMENT

Historically, wind farm OEMs have often been remiss when it comes to correctly aligning their turbine nacelles to true north. Yet correct alignment is vital as current turbine analysis algorithms use the nacelle's deviation from true north to determine whether power production should be curtailed for reasons of shadow or noise disturbance. Likewise, side-by-side performance assessment algorithms use the nacelle's relative orientation to determine the presence of obstacles or wake effects.

Until now, the only solution for operators was to perform a time-consuming manual intervention on each turbine of the wind farm. A step requiring favorable weather conditions for results to be reliable.

AN ACCURATE LOW-COST SOLUTION

ENGIE Laborelec has developed a more practical and cost-effective solution to correct a turbine nacelle's north orientation. We **match an appropriate high-definition satellite image of the wind farm with the related SCADA data of each turbine**. This allows us to dramatically reduce the time and cost of north alignment projects.

BENEFITS

- ✔ **Avoid disturbance claims**
Accurate north alignment ensures curtailment algorithms perform in perfect accordance with the operating license, avoiding disturbance claims.
- ✔ **Increase yield**
Accurate application of advanced curtailment also ensures that a turbine is used to its full potential as defined by the operating license. This is increasingly important in times of reduced subsidies for operating wind farms.
- ✔ **More reliable side-by-side assessments**
With correct north alignment, performance analysis algorithms accurately assess the presence and impact of obstacles or wake effects. This supports you in possible discussions with your OEM.

OUR ADDED VALUE

- ✔ **A rapid, accurate, offsite, low-cost service**
ENGIE Laborelec's north alignment service requires no onsite activity and can be carried out in short notice at a surprisingly low cost.
- ✔ **Great sector expertise**
Our experts have extensive wind farm expertise and are familiar with wind turbines and systems of all makes.

How it works

SOURCING AN APPROPRIATE SATELLITE IMAGE

We consult the databases of various satellite image service companies to source relevant images of the given wind farm, along with the date and time at which they were captured. We purchase and download the most appropriate image in high-definition.

GIS ANALYSIS TO CALCULATE OFFSET

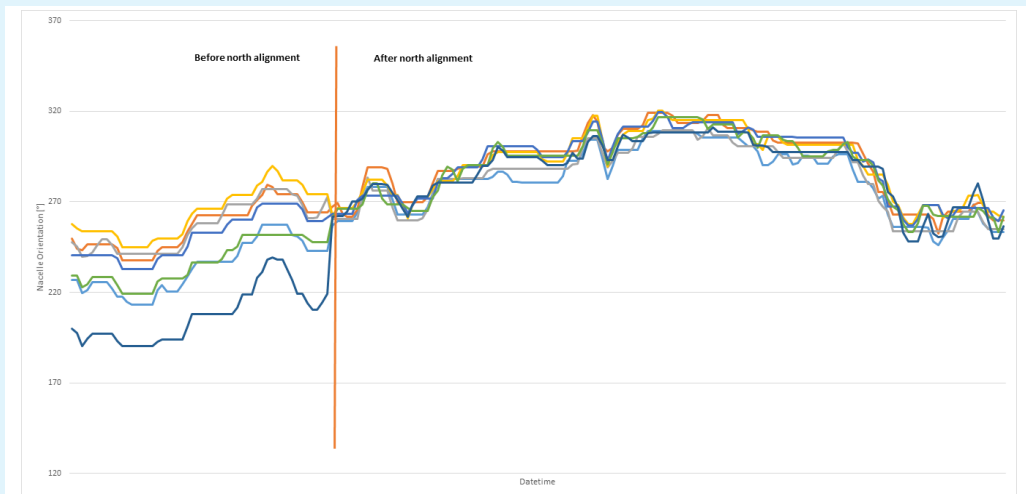
We analyze the image in a GIS system, determining each turbine's real orientation at the given date/time. By combining this with the SCADA data of the turbine, we are able to calculate the turbine nacelle's north alignment deviation.

UPDATE SYSTEM PARAMETERS

The corrected north offset parameters are subsequently entered into the wind turbine control system.

A TYPICAL NORTH ALIGNMENT ISSUE & RESOLUTION MADE TANGIBLE

The diagram below shows the orientation of all turbines of a given wind farm before and after correction for the north alignment over a 4-week period based on SCADA data. As one would expect all turbines of the same wind farm to be similarly oriented, the fact that here orientations vary about 50° indicates that there were severe north alignment issues. The difference for correcting the north alignment using ENGIE Laborelec's satellite-based solution is clearly demonstrated.



More information?

We'd be happy to pay you a visit

ENGIE Laborelec
Stéphane Bronckers

stephane.bronckers@engie.com

www.laborelec.com

Five reasons for you to choose ENGIE Laborelec

- Wide-ranging technical expertise in electricity generation, grids, and end-use
- Customers enjoy enhanced profitability and sustainability of energy processes and assets
- Unique combination of contract research and operational assistance
- Independent advice based on certified laboratory and field analysis worldwide
- More than 50 years of experience