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Reducing the cost of energy through OPEX cost optimisation

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Abstract

While wind farm owners will have a range of operational strategies, they will all ultimately be driven by a ROI over a set number of years, short-term for some, and long-term for others. An O&M approach designed to optimise the ROI for the owner's priorities by leveraging benchmarked data and a total asset management approach is utilised. Costs are fed in for each activity and the ROI over the required timeframe is assessed to provide evidence for any OPEX costs.

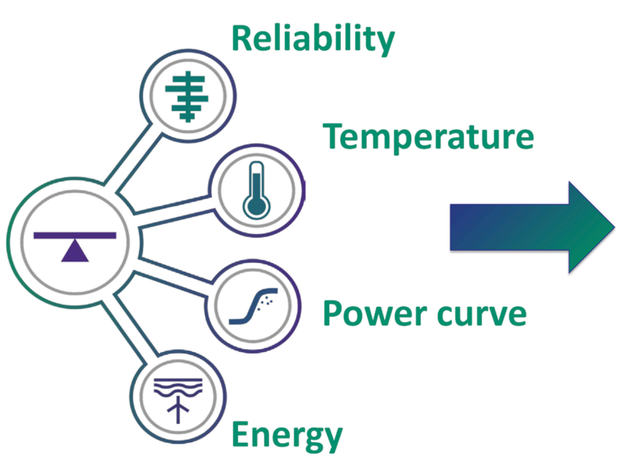
A three step process for reducing the cost of energy through OPEX cost optimisation is undertaken. First, the asset owner/operator is given a clear understanding of the performance of their assets through analysis of SCADA and other available data. Secondly, a comprehensive review of the management of the wind farm site is undertaken. Finally, and most importantly, the intelligence gained from the performance analysis is fed into a performance cost model which produces O&M plans that consider the ROI for each task recommended. From this, an optimised O&M strategy is defined. Case studies are presented to demonstrate results.

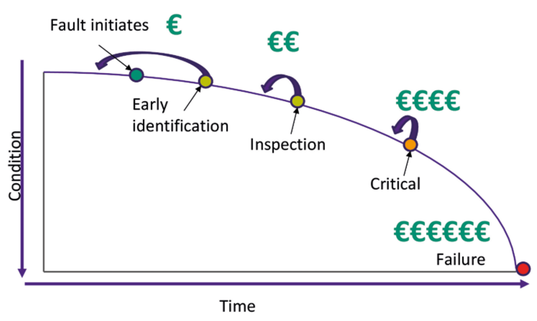
Objectives

Root cause identification of turbine underperformance can be used n order to inform wind farm performance improvement plans and reduce the cost of energy for operational wind farms.

The best value within operational wind farms can be achieved by using a combination of advanced analytics and improved turbine performance and operations and maintenance. Advanced analytics combines machine learning algorithms and computational fluid dynamics in order to identify underperformance and predict failures.

Methodology





Initial desktop analyses quantify historical operational performance and highlight areas for potential improvement. A suite of follow-up services are then outlined in a tailored performance improvement plan. The outcome from these are fed back into the initial analysis to further refine this analysis, enabling continual improvement and overall performance optimization of the assets.

Follow up services include:

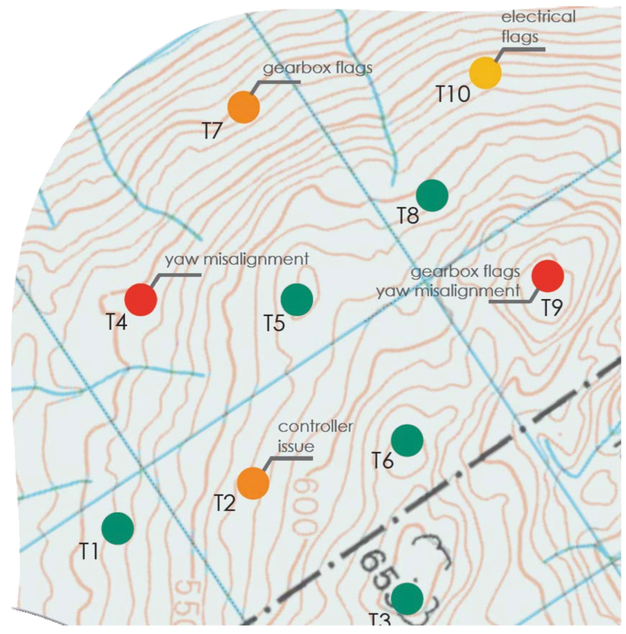
- Optimized maintenance recommendations
- Bespoke measurement campaigns
- Targeted inspections
- Controller setting improvements

Case Study 1 – Small Wind Farm

Underperformance was suspected at an 8 turbine site and performance modelling and analytics was run over a one year period.

Over the year where performance modelling was conducted, the following operational efficiencies were achieved:

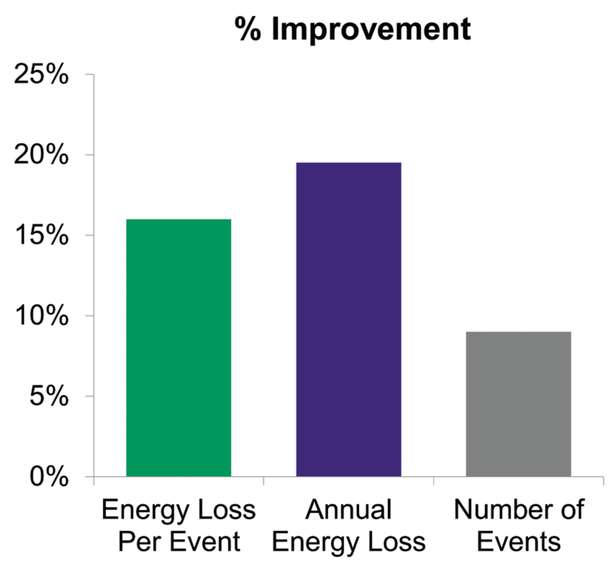
- Information transfer between asset management, servicing, inspection and analytics teams
- Maintenance was conducted to ensure the most productive turbines were prioritized.
- Turbine improvement was realized on four turbines, with relative increases of up to 5.1%
- A gearbox was proactively replaced
- The resulting improvement in production over the course of the year was calculated to be **1.9%**

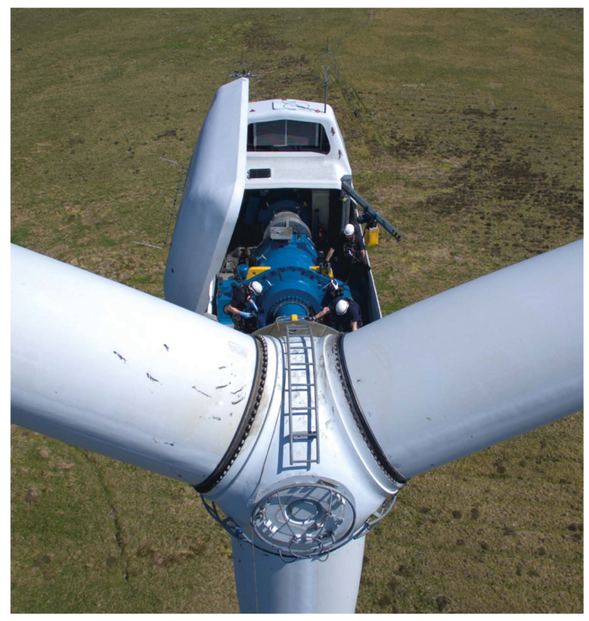


Case Study 2 - Large Wind Farm

A continual improvement campaign at a 60 turbine wind farm was carried out where Natural Power was responsible for all aspects of wind farm operations. A deep dive performance analysis of three months data allowed various performance improvement opportunities which were realized over the following year.

KPIs including failure rate and energy losses were observed to show significant improvements with an estimated value of **€560k per year.**





Conclusions

The developed analytical and asset management approach has been shown to deliver performance benefits and reduce OPEX at wind farms of varying size and complexity. It is possible to optimize wind farm performance by combining desktop and physical analysis by incorporating feed-back into the holistic total asset management approach.

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