Integrated Asset Management for Wind Power Industry

Overview:

Asset Management is found to be a useful instrument to improve overall business performance and should be considered to be implemented by companies in the wind power industry to bring down the Levelized Cost of Energy (LCoE) of wind power and gain a competitive advantage against fossil fuels with an objective of replacing them in the future.

Wind asset management is breaking ground globally. With plummeting costs and turbine design innovations, wind energy has become a front-line contender to support the world's power needs.

Wind energy asset's life cycle is generally complex due to the technology's dependence on various external factors – wind characteristics in a location just to mention one of them. Increasing demand for renewable energy and thus also for wind power, incentivizes more research and development in this sector, resulting in an increasing variety of technical options.

Why Asset Management:

It is important for the wind power industry to introduce Asset Management frameworks into their management, especially but not only for the maintenance of wind turbines in order to reduce their downtimes and increase maximum production. The Operations and Maintenance (O&M) of turbines which is responsible for about 25% of the total costs offers the largest saving potential for Asset Management. Another aspect is the cost which can be reduced by introducing an Asset Management framework as part of the whole lifecycle of a wind farm and all the necessary working tasks connected to it. Adequate planning and decision-making as per the Asset Management framework will reduce risks and costs throughout the different phases of the lifecycle delivery.

Asset Management for Offshore and Onshore Wind Turbines:

In comparison to Onshore, Offshore wind farms and their life cycle operations have a number of different aspects to consider. Nowadays, different technological solutions are being tested for the design, construction, installation, operation, and maintenance of offshore wind farms. Still, the challenges are quite diverse and mostly seen relating to design of electrical infrastructure, structural design and material choice for aggressive environmental and seasonal conditions, site assessment and optimal set-up, substructures, installation methods, logistics, technical service access, operations & maintenance and many more.

The typical lifetime of an onshore wind turbine is anywhere between 20 and 25 years. Maintaining the optimum efficiency level of operational wind turbine assets is an aspect that has been increasingly debated upon in wind industry circles. The point is of paramount importance at the moment considering a good percentage (~10 GW) of our existing installed capacity has crossed 60-70% of their design lifetime.

From Operation & Management to Integrated Asset Management:

It is the need of the hour for the wind industry to largely adopt predictive maintenance into their O&M approach so that assets' operation and energy generation be optimized by factoring the behaviour of repeated alarms and errors generated by the wind turbines through their SCADA (Supervisory Control and Data Acquisition) system. One of the service providers' industry research shows that onshore wind turbines come under at least one major component failure per year resulting in a minimum of 4 days of turbine downtime and significant energy losses during this time. Adoption of fine-grain predictive maintenance and analytics making use of FTT (Failure to Thrive) and OPC architecture (Object Linking and Embedding for Process Control, which is essentially an interface for real-time data transfer) data can have a positive impact in terms of simulating fault progression thereby giving the owner an estimated timeline to act well before probable failure.

Another debate about sharing SCADA Data continues to cripple the rate at which the wind industry is benefitted. Although improving data transparency and availability will help enable synergies between different verticals thereby enabling efficient benchmarking across WTG models, it is also equally, if not more, important that the SCADA data received is lossless and of very high quality which can hence be leveraged upon to perform constructive analysis.

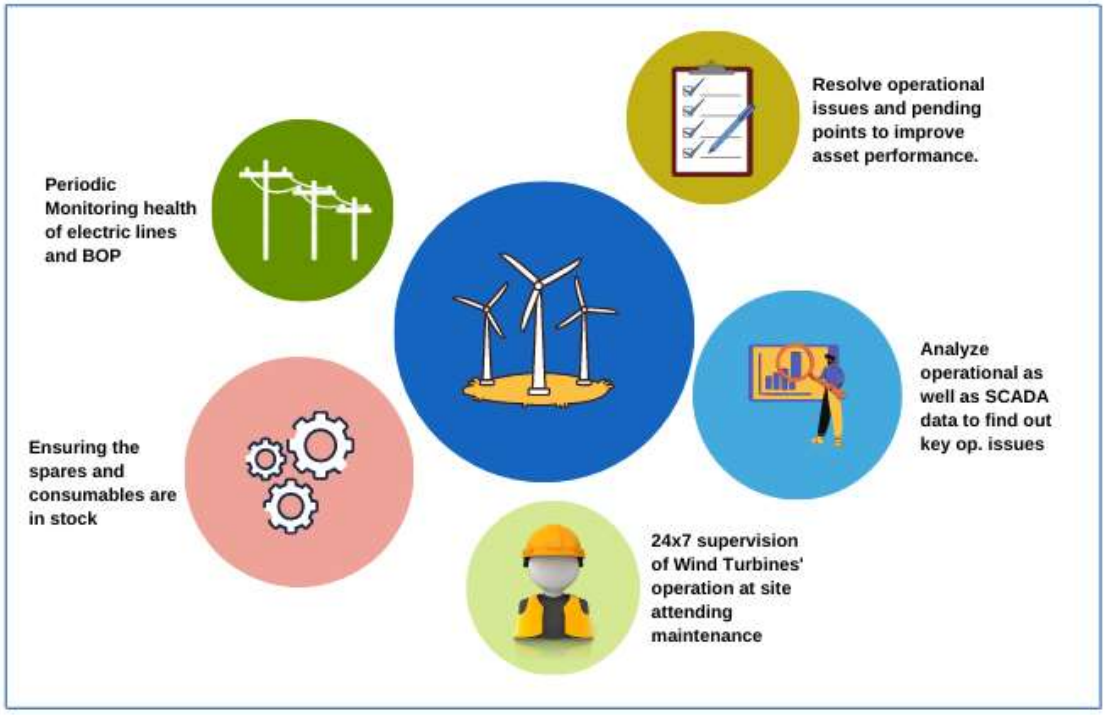
All the hype in the wind industry about employing machine learning and big data analytics is, without a doubt, blowing the winds in the right direction. However, what also needs to be kept in mind is that these methods would need to be equipped to cater to the actual problems faced by the industry such as early-on fault detection, deeper root cause analysis, and earlier signalling of the need for a component replacement, rather than providing a generic picture. There is a need to quantify the performance improvement on wind turbine assets which could then realistically quantify its positive impact on profitability.

Though employing data science and operational data analytics for fault prediction and maintenance schedules are still at a nascent stage, continuing this push will lead to incremental improvements in the turbine performance.

For the betterment of the wind industry, it is becoming increasingly important for regular and comprehensive O&M approaches to be supplemented with SCADA data-based analytics tools so that the staggering O&M costs may be tamed by planning parts' replacement well before costly catastrophic failures. This approach features an efficient, result-oriented, and multi-faceted asset management strategy coupled with the ongoing O&M.

There is a slightly steep industrial learning curve that needs to be scaled by budding asset management firms that are focusing on wind data analytics and machine learning. This could be supported by manufacturers and turbine owners by facilitating high-quality SCADA data from their wind turbine assets to gain deeper and actionable insights into their asset performance. Also, individual components, at least the cost-intensive ones such as gearboxes could be integrated with built-in data analytics and supplied as standard.

The technical services management in the post-commissioning phase needs the following types of supervision and maintenance work. This work requires extensive experience in the sector coupled with current trends in big data analytics and machine learning. Periodic drone-based inspections are also necessary.



Asset Management Standards:

In order to ensure that technical requirements are met, e.g. the annual power production, safety for workers and the environment, a wind farm manager should develop their own minimum requirements which have to be met while also complying with the legal requirements in the country. When procuring or installing turbines or turbine parts, as well as measuring wind, it is recommended that they are built according to international or at least national standards of the country of installation. The IEC 61400 Standard series by the International Electro-technical Commission is a range of standards which outlines the

requirements for wind turbines to ensure that they are developed correctly so they can work through their life without damage and minimal downtime.

Turbine Management and Analytics by TÜV Rheinland:

In addition to other Wind Consulting and Certification services, TÜV Rheinland India offers reliability infused technical Asset Management services during the operations phase based on our decade-long experience and strong credentials in the sector, coupled with the latest trends in big data analytics, image recognition, and machine learning. Following the shift in focus from reactive to proactive engineering, TÜV Rheinland helps in augmenting the wind turbines' routine as well as planned maintenance activities with reliable operational SCADA data-based insights, which results in both immediate and long-term turbine health benefits and performance improvement.