



Achieving efficiency and control in wind operations

Maintaining consistent and effective power production continues to be a significant hurdle for those managing wind assets. The combination of older equipment, a lack of qualified personnel across the industry, supply chain pressures, rising costs due to inflation, and expanding wind energy projects puts a heavy burden on even the most seasoned operators to stay profitable. It's clear that to preserve their position within the energy market, wind energy providers need to prioritize operational efficiency and reliability, leveraging every available resource.

Over the last year, turbine reliability dominated the headlines. Developers, investors, and operators alike are understandably nervous about their ageing assets and new turbine technologies with limited track records.

Full-wrap maintenance service agreements: effective risk management or a false sense of security?

Data collected from the operation of thousands of wind turbines over the years present sobering news to wind asset

operators and owners. Operating and maintaining such assets comprise about 58% of a project's total lifetime costs. And unplanned maintenance contributes to up to 65% of that O&M cost component, often arising from unexpected major parts failures.



full-wrap agreements to mitigate the risk of unexpected failures unnecessary. These technologies can quantify the risk of unplanned maintenance, offering 12 to 24 months of visibility into the health of assets with a high degree of confidence, and then mitigate the risk by informing the predictive maintenance required.

Closing the loop: achieving control with a comprehensive predictive maintenance strategy

Today, all large wind asset owners and operators employ condition monitoring services and predictive maintenance (CMS/PM) to reduce unplanned outages. Digitalising their operations provides insights for predicting failures well in advance, allowing time to secure replacement parts, engineer the best corrective solutions, and schedule the required skilled labour, tools, and machinery to facilitate repairs.

Furthermore, digitalisation makes monitoring multiple turbines across different sites and regions easy. In short, thoughtful digitalisation of wind power operations significantly reduces O&M costs and boosts power production and revenue.

At the same time, owners of smaller portfolios often need help to shift from total reliance on OEMs to taking more control of their assets. This transition is further complicated by the sheer volume of digital technologies available, each promising transformational returns but coming up short in practice. The smart choice for owners is to start small and focus on flexibility when implementing the technologies.

There is no single best-value CMS solution to fit every situation

ONYX Insight has spent over a decade developing software and sensing solutions

for the drivetrain, pitch bearings, blades, and towers. Our hardware products use sensors to detect vibration, temperature, acoustics, and lubricant quality and are designed to deliver value at every stage of a turbine's life, regardless of turbine model.

These products can work together or as a standalone solution. After assessing our customer's needs, we design our solutions to enable them to gain reliable clarity over the health of their assets. This way, asset owners receive the best return on investment by employing our advanced diagnostic technologies designed for their assets to shift costly unplanned outages to a controlled predictive maintenance routine.

This process works well even in tandem with full-service maintenance contracts, as it gives wind farm owners the insights to engage with their service providers on an equal footing, allowing them to budget more accurately and achieve better control of maintenance quality.

Most importantly, it enables the flexibility to respond to changing market dynamics. Indeed, many ONYX customers discovered that switching from full-service agreements to a hybrid maintenance contract model, where major components maintenance is managed in-house, greatly benefited their OPEX and availability. Additional savings can be unlocked by sharing CMS costs – for example, the owner purchases the hardware, and the service provider covers the cost of monitoring software.

Maintaining independent data analysis is critical, as there are many conflicting priorities between asset owners, OEMs, and service providers. For example, ONYX customers benefit from our complete and independent knowledge, expertise, and extensive database acquired over more than a decade across 20,000 turbines worldwide.

The resulting downtime, exacerbated by rising prices and the lengthy lead times for maintenance crews and replacement components, negatively impacts already tight margins.

It's no wonder that many asset owners prefer to outsource such risk to OEMs under full-wrap maintenance service agreements. However, reliance on these agreements adds significant risks to long-term operations. Full-service maintenance contracts come at a premium. OEMs and other service providers price their contracts to offset the risks of unexpected failures.

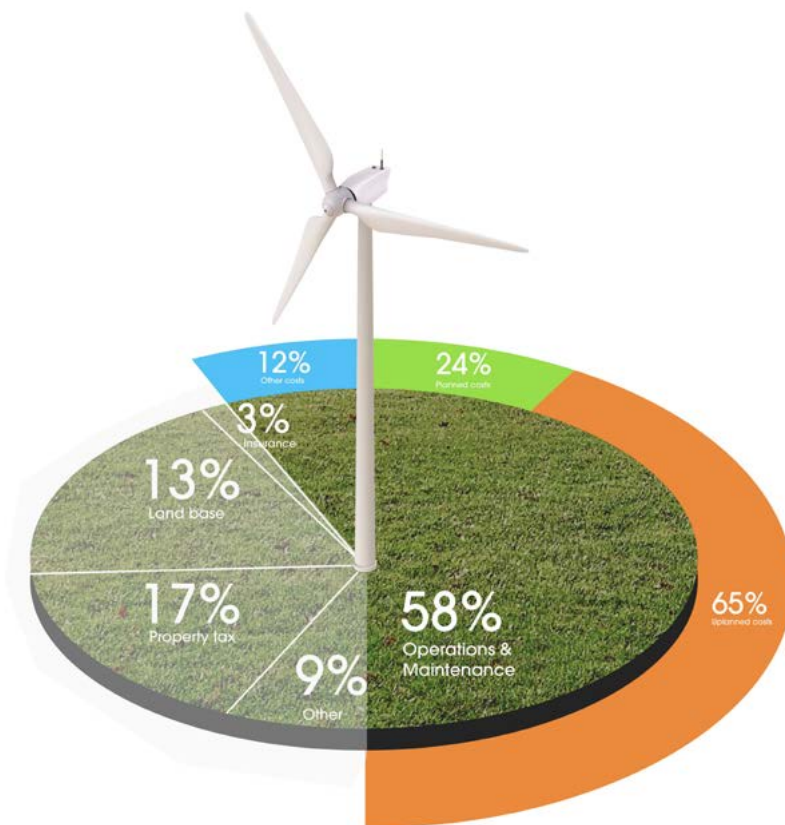
The misalignment of priorities that can arise between owners and their contract service companies not only risks profits but can also negatively affect assets' health when short-term actions are taken at the expense of long-term reliability, shortening the lifetime of the assets.

Additionally, writing a contract to completely capture maintenance requirements subject to change over time can be challenging, especially in a dynamic market environment.

This business model of transferring the unquantified risk of unscheduled maintenance to insurance companies, OEMs, or independent maintenance service providers is no longer viable due to associated high costs that all players in the sector find hard to accommodate.

However, condition monitoring and advanced diagnostic technologies render reliance on





Flexibility in implementing a CMS program is fundamental to achieving the best value

While developing comprehensive CMS expertise in-house may be challenging, relying on third-party service providers across an extensive asset portfolio can be wasteful.

Finding the right partner for technology transfer can quickly resolve this conflict. An owner can work with a solutions-oriented partner like ONYX to assess the degree of CMS/PM services they should deploy for their unique situation, accounting for asset age, number of assets, location, and other risk factors. Then, they can customise their CMS program to pay only for the services required to manage their distinctive risk profile.

For example, ONYX will work with an owner's in-house team, training them to take over when they are ready, leaving them with customised alarms and bespoke software to manage their portfolio. This model offers the best of both worlds; the benefit of expertise and a massive body of data from an independent expert, plus the flexibility to deploy an in-house team when required.

Don't forget the basics and lose value between siloed solutions

Large operators with a portfolio of assets comprising a mixture of turbine technologies often rely on different CMS software designed to operate with specific turbine models. By working with multiple software packages, analysts are forced to switch

between various screens and employ yet another tool to compile and monitor key performance indicators (KPIs) to measure the effectiveness of their CMS strategy.

The added complexity is why only some players perform the work correctly. Without centralised KPI monitoring, most operators miss out on the benefits of continuous improvement and even overlook major failures.

ONYX is the largest independent technology provider to offer a hardware-agnostic CMS platform capable of reading data and providing uniform metrics across all hardware types. ONYX CMS platform, fleetMONITOR, offers clear benefits; operators need only learn one monitoring system to generate consistent performance KPIs across their entire portfolio, and they can apply advanced diagnostics at the core of their maintenance activities by integrating that work with other decision-assisting tools like maintenance and spares management or scheduling algorithms.

Sensors alone cannot drive decisions

In the complex world of wind farm operations, multiple decisions must be made following defect detection. What maintenance activity is required and when? What is the best way to mitigate the risk to other assets? What is the future risk exposure?

A single failure detected in time can pay for the entire CMS programme, whereas a single wrong decision can consume a

sizable portion of the maintenance budget. ONYX is unique among other analytics providers in our ability to deliver deep engineering expertise and close the loop between fault detection and implementing corrective action in the field. This ability provides big wins for asset owners by extending the life of their ageing assets, reducing unplanned outages, avoiding catastrophic failures, and optimising scheduled maintenance efficiencies.

Staying ahead of your peers with smart and efficient operations

The wind energy sector is growing and maturing as a vital component of the global energy mix. This drives the need for the industry to improve the efficiency and predictability of operations to remain profitable and reach its full potential. Currently, condition monitoring tends to be a siloed, short-term solutions applied when necessary, shortchanging the game-changing benefits that a comprehensive predictive maintenance program can deliver.

Closing the loop between detection and mitigation is the key to a successful predictive maintenance program. The flexible, data-driven predictive maintenance model that ONYX supports provides owners and operators of any size portfolio with a robust end-to-end solution for optimising the operation and profitability of their wind power projects.

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Evgenia Golyшева is VP of Strategy & Marketing, at ONYX Insight, a leading global predictive analytics solution provider, with a combination of software, hardware, consultancy & engineering services exclusively for the wind industry.

ONYX monitors 20,000 wind turbines in over 30 countries around the world.