STANDING IN THE WAY OF CONTROL

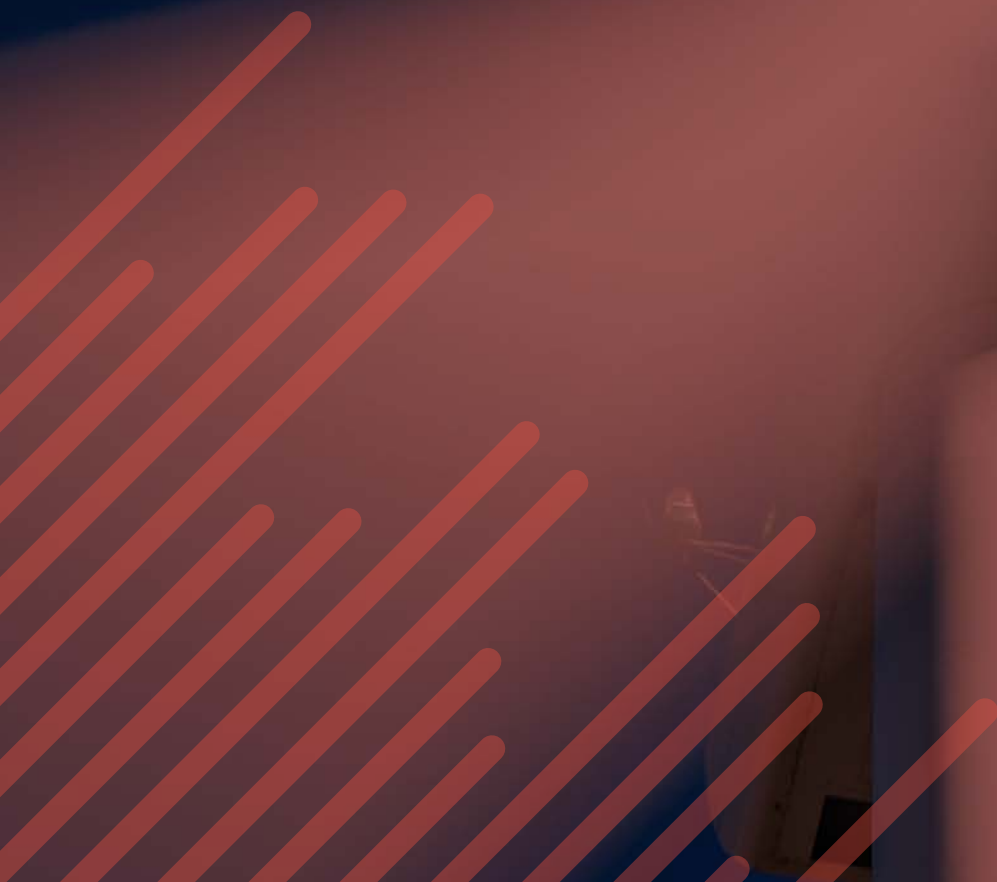Are you getting full access to the turbine performance data you need?

Data access in wind energy

Report 1

ONYX INSIGHT

FOREWORD

BRUCE HALL

CEO, ONYX INSIGHT

Wind farm owners and operators are leaving money on the table if they fail to secure access to all the **Operations and Maintenance (O&M)** data necessary to take advantage of the full scope of operational management and performance optimisation techniques on offer.

This whitepaper is not going to argue for the digitalisation of maintenance and inspections, since, by now, the advantages of a digitalised approach are well-understood by asset owners worldwide.

Digitalisation reduces time spent by technicians on site, minimises safety hazards and creates a far greater understanding of asset health that leads to huge savings in repair and replacement costs. However, the industry is struggling to fully realise these benefits - which could **reduce operational costs by nearly one fifth** - because O&M teams are being denied access to the data that would allow them to hit these ambitious, but achievable, targets.

Better data access across the board can lead to incremental gains, but there are also giant strides to be made if owners and operators can obtain a better view of just a handful of critical data streams.
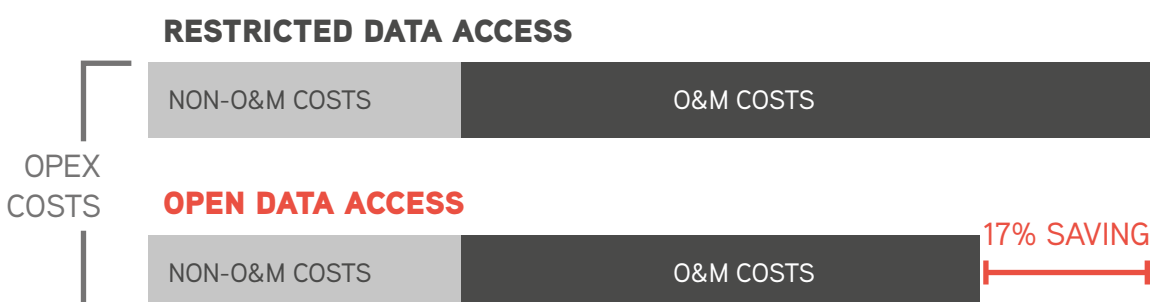
This whitepaper looks at all the operational data streams wind farm operators need, outlines to what extent each of these is important for successful analysis and operation, and finally gauges how accessible this data really is for equipment owners in light of manufacturer restrictions.

The latter point is critical, since, while owners continue to invest in the systems and cutting-edge technologies needed to collect a wide variety of performance indicators and make them easier to analyse, the very designers and operators of those systems are preventing them from gaining full clarity over turbine performance by restricting access to the data produced.

Access levels can vary across the market, with some suppliers providing a high degree of access, while others, by offering only a highly-processed subset of data, limit what can be done with it. Other suppliers deny access to owners outright.

Clarity and control over turbine performance, costs and revenues, require an uninterrupted stream of high-quality, readable raw data. This data – every second, degree or Hertz – should belong to the asset owner. That being the case, how can owners be sure they have access to all their data, and what data should they have access to?

Improving ROI through open O&M data access

RESTRICTED DATA ACCESS

| NON-O&M COSTS | O&M COSTS |

OPEX COSTS

OPEN DATA ACCESS

| NON-O&M COSTS | O&M COSTS | 17% SAVING |

What are the different types of turbine performance data, and what do they tell us?

SCADA DATA

Data collected from supervisory control and data acquisition (SCADA) systems installed at wind farms covers hundreds of parameters. Some of these parameters include power, wind speed, blade pitch angle, tower acceleration and drive-train temperatures.

SCADA data is often pre-processed to exclude data caused by sensor failures, transmission errors, and failures of various subsystems. Once the data is cleaned, it is then typically reported as an average of a ten-minute time interval. This processing helps improve the quality of data for analysis fed in to models such as digital-twins, drive-train vibration models and power generation models. However, the loss of very granular one-second data during this processing has the downside of masking the real-time turbine behaviour, that could provide important indicators to support analysis for longer-term predictive maintenance.

ALARM CODES

When a fault occurs in the machinery and appears in SCADA data, some faults will set off a single alarm, while others will trigger a series of different alarms, known as a fault signature. Turbine owners and operators should be free to access the alarm codes and their meanings, so they can run their machinery properly.

Being clear about the meaning of each alarm helps analysts diagnose issues correctly and plan how to respond to them. Indeed, knowing how different alarms are triggered and what faults they indicate allow analysts to judge whether alarms are genuine or false, given all the other data they are able to access and consider.

CMS DATA

Condition monitoring systems (CMS) attach highly sensitive, durable and accurate sensors to rotating machinery in order to collect and record vibrations and temperature. The types of technology used in the sensors may vary across the hardware offered by different providers, however, the fundamental measurements remain the same, whether the sensors are analogue or digital.

CMS hardware can either be factory installed as part of the turbine OEM offering or retrofitted as an aftermarket installation. This makes it flexible for monitoring older wind turbines. While condition monitoring systems can collect data continuously, it is typical for owners to only receive alarms from their CMS when there is something of concern. CMS alarms certainly help owners make better O&M decisions about maintenance, and all owners with CMS outfitted tend to have access to the alarms, but more granular data, including processed trend data, or even raw measurement data, can bring greater capability to performance analytics.

LUBRICATION DATA

Oil and grease data for gear and hydraulic systems can be collected continuously via sensors fitted on a factory-installed or aftermarket condition monitoring system. Alternatively, they may also be collected during routine inspection and maintenance windows. However, in this case, temperature and viscosity measures will not be representative of conditions during operation.

Two types of lubrication data are typically collected:

Oil condition – assessing what condition the oil itself is in.

Debris – looking at debris in the oil that indicates the level of wear in the machine.

The data gathered can indicate the level of contaminants in the oil and the wear on components in contact with the oil or grease. This data can then be fed into wider models to understand past performance and predict the future lubrication, maintenance and repair needs of the turbine.

INSPECTION REPORTS & IMAGES

While many inspection and repair teams are still using pen and paper methods to record turbine inspections, it can be incredibly difficult for owners to record, store and retrieve accurate data. This, in turn, creates a challenge to get it into the hands of analysts who can use it to help improve the performance of assets.

However, as digitalisation is gathering pace in the industry, there are more opportunities to overcome such obstacles using cloud-based reporting and for owners and operators to utilise inspection data fully in predicting the maintenance needs of assets.

RCA REPORTS

Root cause analyses (RCAs), which determine clearly the cause of failure in wind turbine drive trains, are essential for any owner attempting to understand performance and plan effective operations and maintenance. RCAs allow operations and maintenance teams to identify patterns of performance and failure and ensure these become a feature of teams' planning for maintenance.

GEARBOX KINEMATICS

The question of whether gearbox kinematics should be treated as performance data is an important one. While related to the design of the gearbox, kinematic data reporting on the behaviour of the gears and planets during operation is valuable for analysts to understand the effects of the environment on performance.

→ What about IP data?

Data access is an important debate in the wind energy industry that spans a number of different areas, and often strays into the area of intellectual property (IP). However, for the purposes of improving O&M approaches – the focus of this whitepaper – access to IP data is unnecessary.

IP data is clearly a sensitive area for OEMs in the wind energy value chain, and it should rightly be protected. Escrow solutions are often talked about in this area, but those don't - and should not - apply to performance data.

IP data is explicitly defined as design data, drawings, CAD and CAM files, load calculations, etc. which are clearly owned by the OEM and are not required by turbine owners to operate their machines.

There is a clear difference between IP data – created by the OEM during the design, development and manufacturing of their equipment – and operational data, produced by the turbine during operation, and captured by various monitoring and inspection systems. With a clear understanding of the difference, turbine owners should be confident of securing full access to operational data for the machinery in their fleet as a matter of course.

How is data access being restricted?

Restrictions on data reduce owners' and operators' long-term clarity and control over their assets. Analytics and consulting for wind turbine optimisation can only be as good as the data available. Though new hardware and software technology are advancing digitalisation in the industry and making data sharing simpler, many owners still face significant barriers to their data.

For instance, of the **top CMS hardware providers**, who account for over 80% of the market (factory set and aftermarket), **only one** gives turbine owners and operators full access to CMS data, and seven of them give no access to data at all, limiting the maintenance and servicing options of turbine owners.

NO ACCESS TO DATA

LIMITED ACCESS

ONLY ONE TOP CMS HARDWARE PROVIDER PROVIDES FULL ACCESS TO DATA
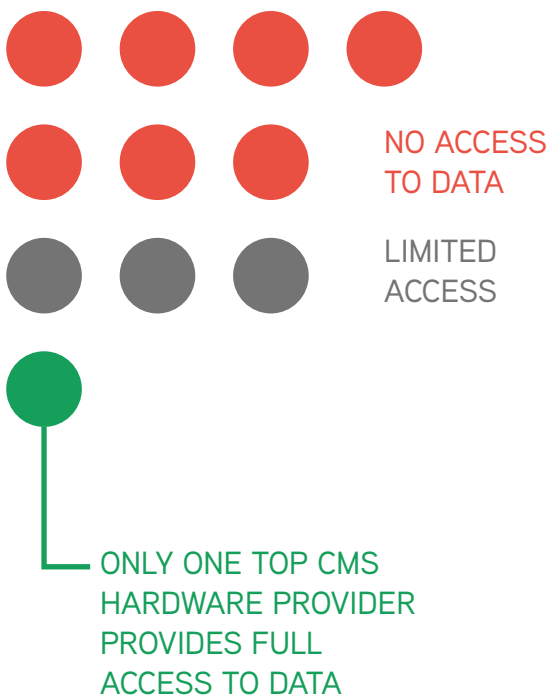
Data is restricted in **three main ways**:

PROCESSING

Raw data is processed and packaged. Data is reported as averages and aggregated across discrete time periods, limiting owners' ability to understand fully what is happening in their machines.

ENCRYPTION

Owners are prevented from accessing data by a gating process. Typically this demands the payment of a subscription or licence to access the data when the owner has already bought and paid for the machine.

OBSTRUCTION

The owner gets no access to the data at all. Barriers are put in place by the OEM, whether contractual or technological, that prevent the owner from knowing anything about the performance of the machine they own.

When it comes to negotiating supply agreements, these methods of restricting data may not be fully appreciated by turbine owners. And while there may be an understanding that data has value, the team negotiating a supply contract may not fully understand what the data actually looks like, how it is used, nor what its full value really is. In such circumstances, and through little fault of their own, owners and operators can find themselves signing a contract that limits the clarity and control they have over their assets.

Knowing what data is covered by a supply contract, and what can potentially be done to restrict it is of vital interest to turbine owners.

Am I getting access to the data I need?

For the purposes of verifying what you know about your turbines, and making sure you are covering all the bases during negotiations over supply agreements, here is a useful checklist to follow.

This covers:

- **Different types of performance data**
- **The typical industry-wide level of access turbine owners currently receive**
- **The minimum level of access required for effective predictive maintenance**
- **The ideal level of access required for full optimisation of maintenance practices**

Procurement checklist

ONYX InSight

DATA ACCESS REQUIRED FOR EFFECTIVE PREDICTIVE MAINTENANCE

WIND FARM:	

TURBINE MANUFACTURER AND MODEL:	

½ denotes data that is partially available, ✓ indicates full access, and ✗ indicates no access.

DATA TYPE	TYPICAL ACCESS	MINIMUM ACCESS REQUIRED	IDEAL ACCESS REQUIRED	YOUR ACCESS
10 min average SCADA data for all tags	½	✓	✓	☐
1 sec SCADA data for subset of tags	✗	✗	✓	☐
All SCADA alarm code events	½	✓	✓	☐
Full alarm code look-up table	½	✓	✓	☐
CMS - Alarms only	✓	✓	✓	☐
CMS – Processed trends only	½	✓	✓	☐
CMS – Raw measurement data	✗	✓	✓	☐
Gearbox kinematics	½	✓	✓	☐
All oil/grease analysis reports	½	✓	✓	☐
All/accurate maintenance records	½	✓	✓	☐
All inspection reports and images	½	✓	✓	☐
All RCA reports	½	✓	✓	☐
Parts lists	½	✓	✓	☐
Full work instructions/procedures	½	✓	✓	☐

NEXT
STEPS

At ONYX InSight, we believe all turbine performance data should belong to the turbine owner.

If you or your O&M teams have encountered data access restrictions during the operation of your wind energy assets, we encourage you to follow the previous checklist during procurement negotiations to ensure you are prepared for your conversations with equipment suppliers.

We also encourage you to join our **Data Access Working Group**, which brings together stakeholders from across the wind energy sector, with a view to raising awareness of and tackling this obstacle to effective, profitable operation.

Click to register your interest and lend your support:

Join our

DATA ACCESS WORKING GROUP

onyxinsight.com/data-access/#register

Standing in the Way of Control is the first in a series of whitepapers on the theme of data access in wind energy. Further publications are planned, covering the legal route to better data access, alongside the operational, commercial and wider industry benefits it brings. Again, if you are interested in lending your voice to the campaign, we invite you to get in touch.