

What is WEBS?

Reporting on key performance indicators (KPIs) is a crucial business process but fleet-wide and industry-wide comparison of these metrics can be problematic due to inconsistencies in methodologies and concerns over confidentiality.

Addressing this issue is the aim of the Wind Energy Benchmarking Service (WEBS), providing independent, anonymised benchmarking data for the wind industry.

Building on the success of SPARTA [5], a similar benchmarking system for offshore assets, WEBS is the new benchmarking platform designed exclusively for operational onshore wind farms.

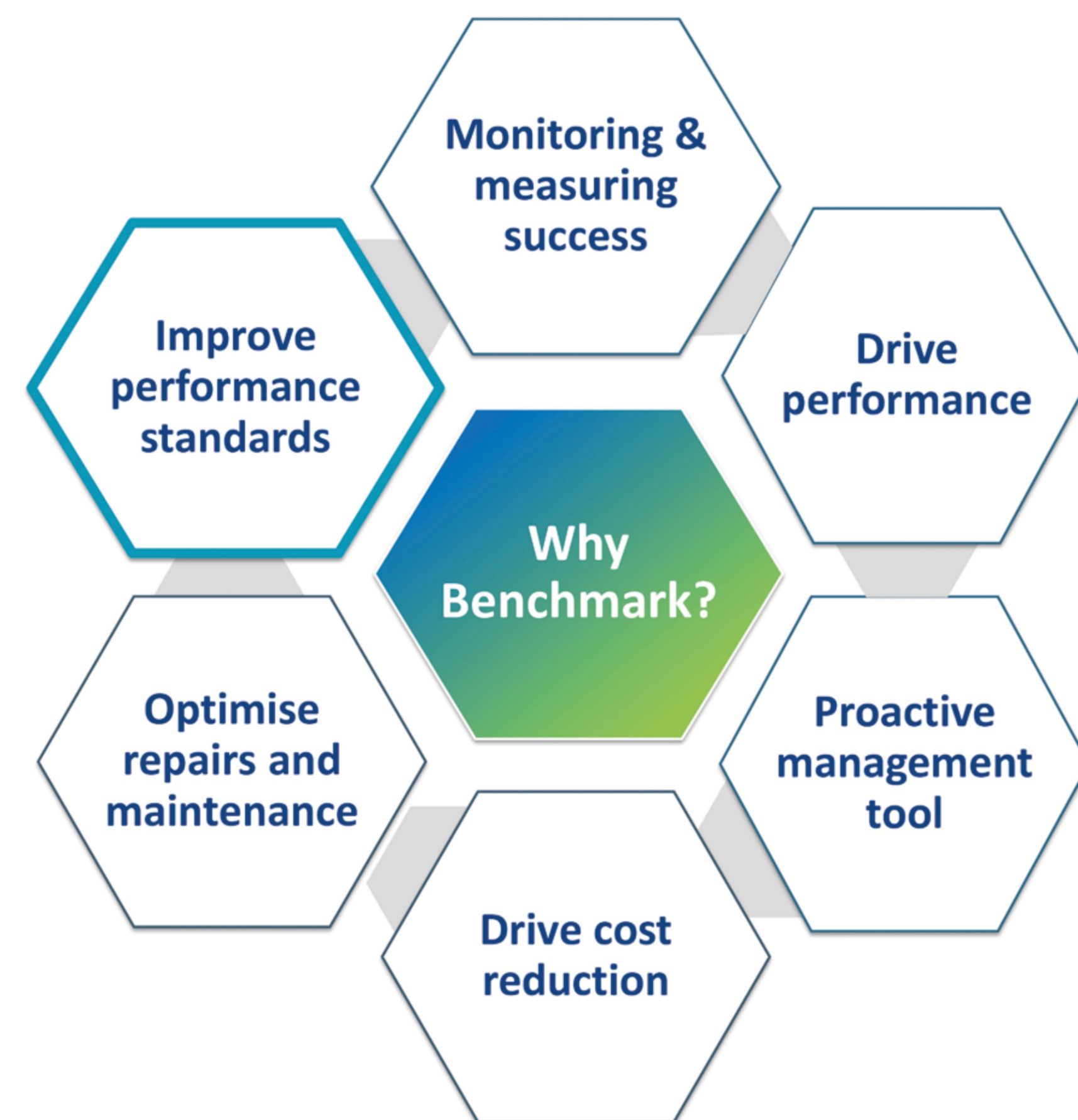


The Value of Benchmarking

Participation in WEBS provides owners/operators with unique insight into successes or performance gaps and provides the ability to develop performance improvement plans.

Benchmarking enables the ability to:

- Drill into where your farm is losing production, and how this compares throughout the sector
- Quantify the reliability of wind-farm sub-systems and identify anomalies
- Identify where to focus maintenance attention for optimum site performance
- Discover potential improvements by comparing similar, but differently managed, sites



Challenges of Standardization in Operational Phase

Addressing one of the key challenges of asset reporting, WEBS adheres to standardised metrics to allow for reliable, informative reporting on key KPIs. This allows owners/operators to align with international standards which have been adopted from best practice in the offshore wind industry. These standards include:

- **IEC 61400-26-1: Time-based availability for Wind turbine generating systems [1]**
 - Time-based availability: Technical and System
- **IEC 61400-26-2: Production-based availability for wind turbines [2]**
 - Production-based availability: Technical and System
 - Lost Energy Production
- **IEC 61400-12-1: Power performance measurements of electricity producing wind turbines [3]**
 - Power performance characteristics of wind turbines
- **RDS-PP: Reference Designation System for Power Plants [4]**
 - Wind Turbine component/subsystem taxonomy

Challenges also arise when trying to standardise a method for failure reporting. Therefore WEBS uses alarm data to report on forced outages and major system repairs, with set guidelines on how to process and categorise alarms.

Additionally, as a means of normalisation within the WEBS system, wind farms are partitioned into 12 systems and 33 sub-systems, where component names are aligned with RDS-PP taxonomy. This enables an OEM independent comparison across the industry, allowing direct analysis against sites with similar dimensions (including regional geography, turbine type and age).

Key Metrics

The WEBS system benchmarks on over 120 performance, availability, reliability and maintenance metrics, including:

Availability

- Production (yield) Based Availability [1] - Figure 1
- Time Weighted Run Time Availability [1] - Figure 1
- Lost Energy Production

Reliability

- Major System Repairs
- Sub-System Forced Outages - Figure 2

Operational Metrics

- Metrics to provide additional context to the benchmarks (site conditions, service durations, data availability, etc.)

How are these Metrics used?

Examples on how these metrics can be used by WEBS operators are displayed in Figure 1 (Availability and Capacity Factor) and Figure 2 (Failure rates and Downtime per failure); where the results are derived from metrics in the WEBS database.

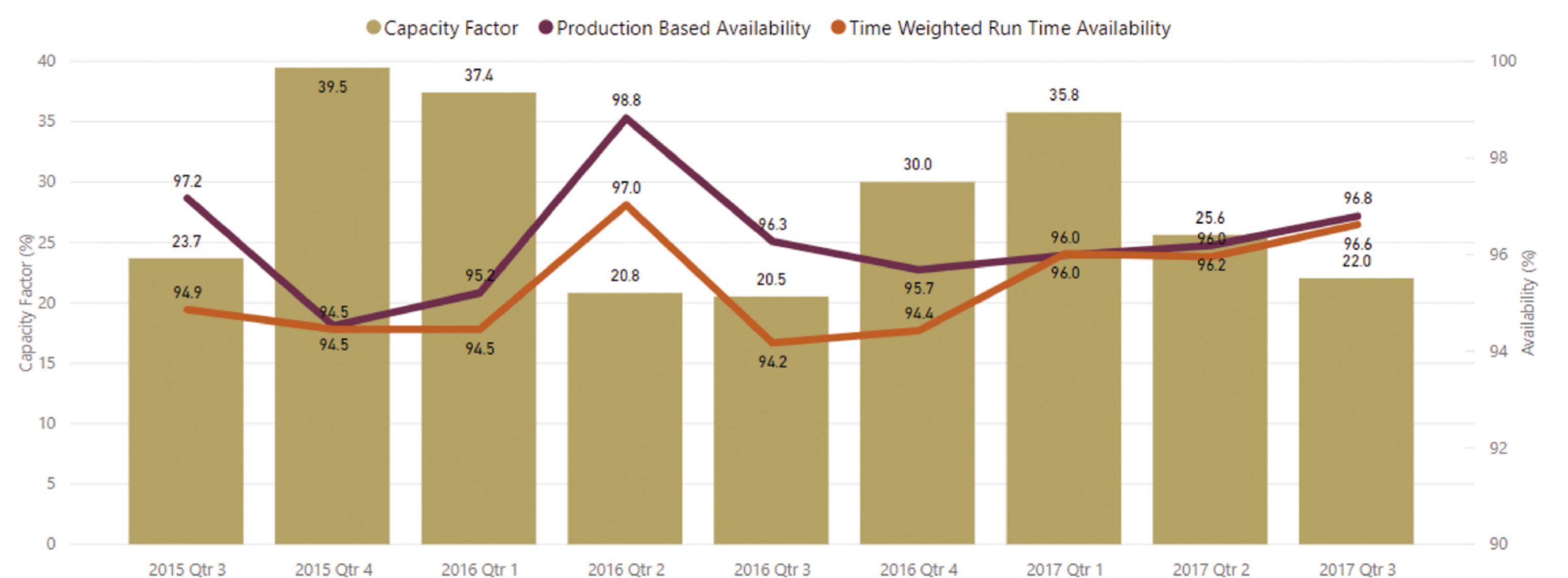


Figure 1: Capacity Factor, Production Based Availability and Time Weighted Run Time Availability

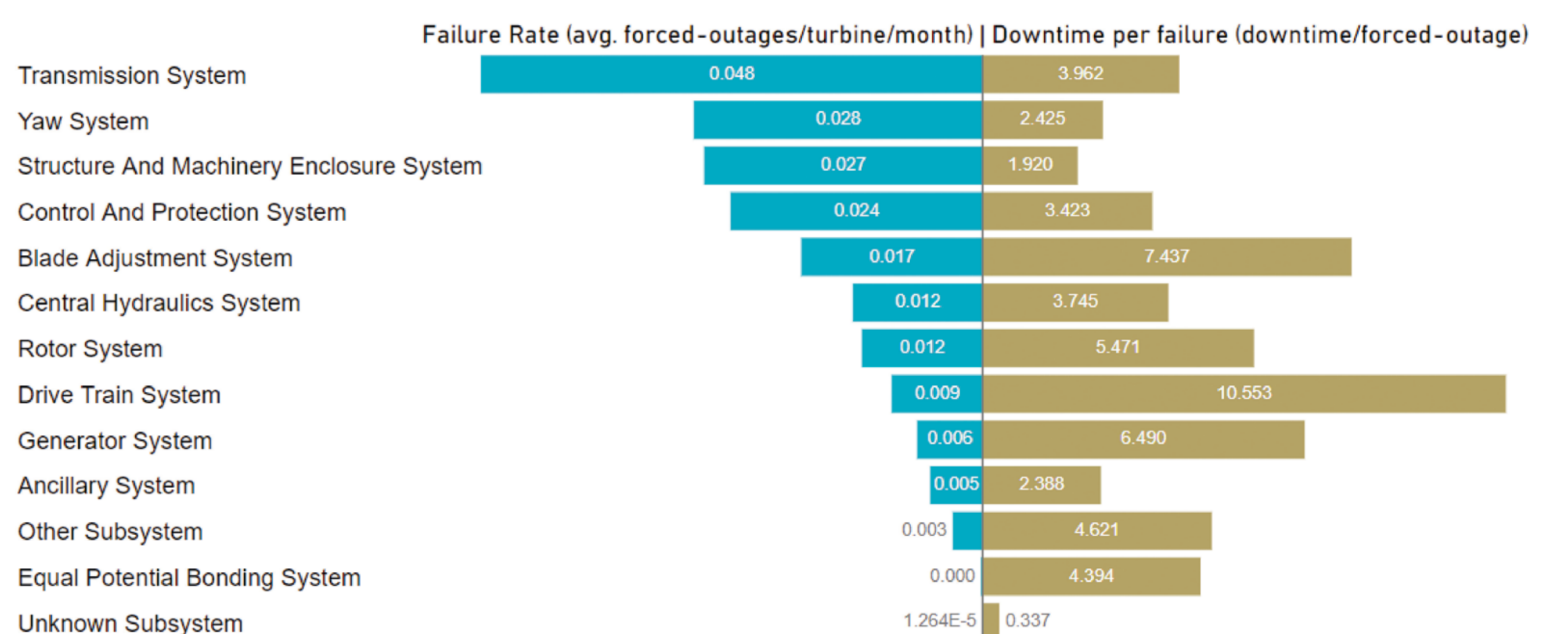


Figure 2: 2017 Q3 - Failure rates and Downtime per failure for subsystems [RDS-PP]

These results raise questions and highlight areas for analysis/improvement. For example, Figure 2 may lead a wind farm operator to review the maintenance strategy of Blade Adjustment systems to reduce downtime. Whereas Figure 1 may answer questions over poor performance; when similarly sized/rated sites also show performance degradation, perhaps due to resource limitations.

Conclusions

Participation in a benchmarking programme is critical to enable access to reliability and performance data, knowledge sharing of best practices and the implementation of standards across the wind industry. Benchmarking programmes are already increasing investor confidence in the wind energy sector and reducing the levelized cost of energy.

All visualizations presented are available as part of the **WEBS Quarterly Report**, available at: www.webs-ltd.com

References

1. IEC 61400-26-1: Time-based availability for wind turbine generating systems, 2011.
2. IEC 61400-26-2: Production-based availability for wind turbines, 2011.
3. IEC 61400-12-1: Power performance measurements of electricity producing wind turbines, 2005.
4. VGB PowerTech, Reference Designation System for Power Plants, RDS-PP, Application Explanation for Power Plants, VGB-B 116 D2, 1st Ed 2007.
5. SPARTA: System Performance Availability Reliability and Trend Analysis, 2018. Available From: ore.catapult.org.uk/casestudies/sparta

