SPARTA
System Performance, Availability and Reliability Trend Analysis

Sparta
Portfolio Review 2018/19

Sponsors Comments

As the industrial chair for the System Performance, Availability and Reliability Trend Analysis (SPARTA) benchmarking system, I am pleased, on behalf of our members, to present this year's Portfolio Review.

The document is an in-depth benchmarking analysis of performance across our fleet of wind farms and can be used to compare a site's performance against others, in addition to providing general industry insight. This review is useful in aiding further discussion and analysis and to inform improvement suggestions to further enhance the performance of wind farm assets.

At Equinor, we use the monthly outputs from SPARTA at sites, in management meetings and in defining our ambitious targets for delivery. It creates healthy competition between assets and motivates further improvements.

The SPARTA network is growing and we now cover 60% of all offshore wind power generation in the UK but we are aiming for more. The value of benchmarking is high; you better understand the performance of your assets and you can compare it to that of your competitors. We all strive to improve performance, which needs to be monitored throughout the year, making SPARTA the perfect tool to perform monthly benchmarking analysis. Benchmarking becomes more valuable as the number of participants increases. Our goal is therefore to expand our membership into Europe and we hope to introduce our first non-UK member before next summer.

Exciting improvements are also being made to the metrics. Following the successful review of the production-based availability metric, a review is being undertaken of the forced outage metrics.

Being a member in SPARTA not only gives access to benchmarking tools but also presents networking opportunities across industry at several levels. Sharing knowledge, experience and lessons learned is vital if we are to continually improve operations, performance and Health & Safety.

I hope you enjoy reading the report and the insights it presents and my thanks to the Offshore Renewable Energy (ORE) Catapult for producing this comprehensive Portfolio Review.

Mona Riis
Manager Operation & Maintenance
NES NEO OEX
Equinor ASA

Sponsoring Organisations

SPARTA Members

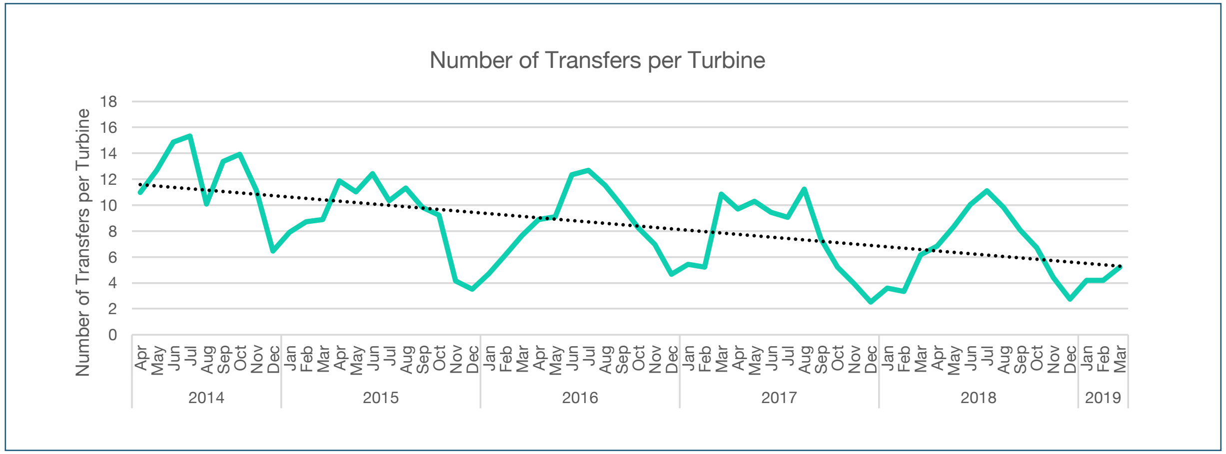
1. Executive Summary

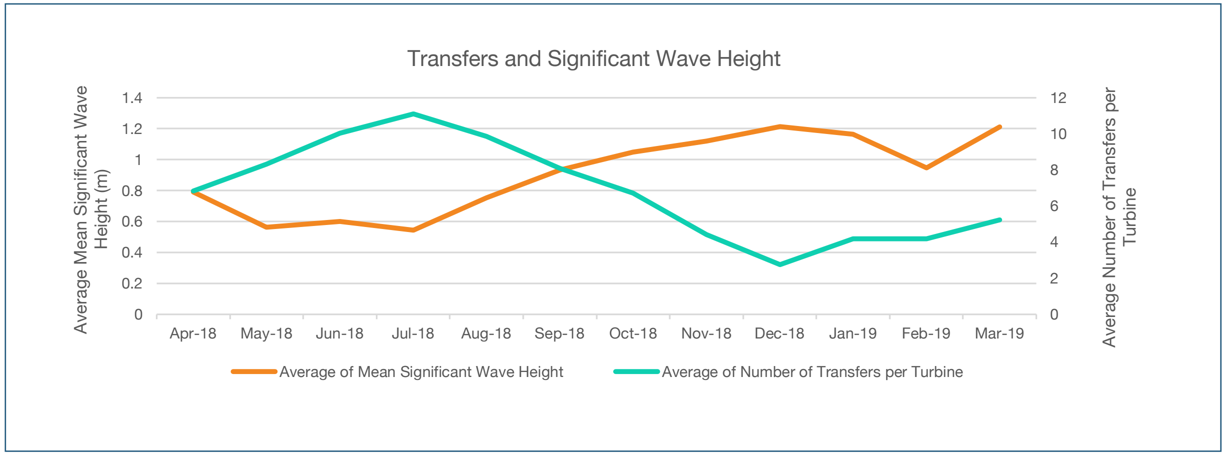
SPARTA is a platform that allows for secure data sharing and aggregation of data for anonymised benchmarking of offshore wind farms. By using industry validated Key Performance Indicators (KPIs), owners and operators can ensure true benchmarking can take place.

The following report presents analysis of the 19 participating wind farms over the period April 2018 to March 2019 and shows deep-dive results revealing longer term trends.
High Level Results

Across the SPARTA portfolio, the 2018/19 period saw over 13 TWh of energy being generated, enough energy to power over four million UK homes. This energy was generated with an average capacity factor of 36% and an average production-based availability (PBA) of 95%.

As was reported last year, the number of technician transfers per turbine is reducing year on year. This year was no exception, with the lowest average number of transfers per turbine at 6.81 per month. It is imperative to reduce the number of transfers per turbine as less transfers means less chance of personnel injury. The SPARTA data also showed how the number of transfers per turbine varied by the month and significant wave height during that month.





Executive Summary continued

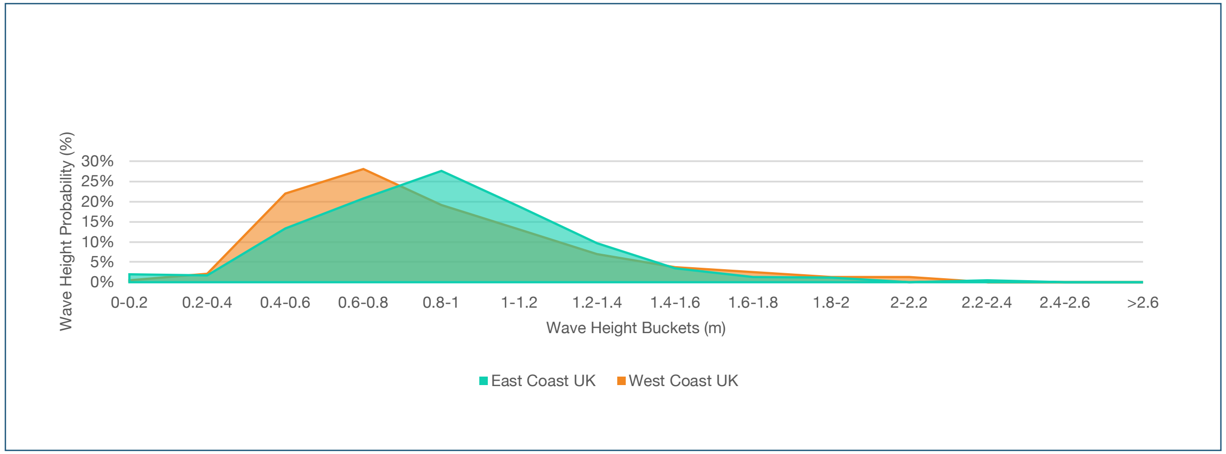
Deep Dives

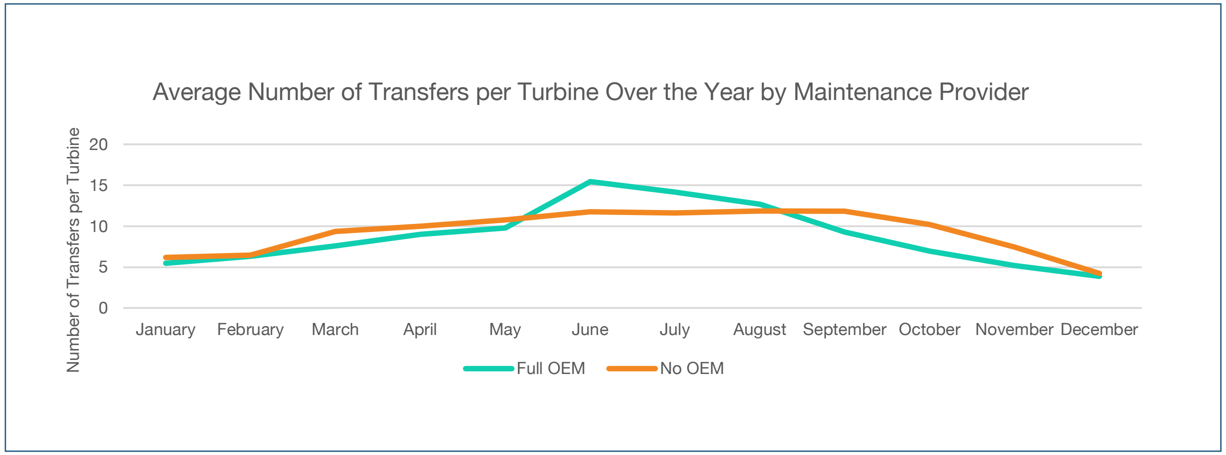
Two deep dives were performed for this portfolio review. The first looked at the difference in performance between East and West coast wind farms. Over the past two years, the East coast wind farms have had higher PBA values than West coast wind farms yet have failed to meet the capacity factor values the West coast achieves. During this deep dive an interesting finding was that the significant wave height varied between the two coasts, with West coast wind farms having a higher chance of lower wave heights.

The second deep dive investigated different maintenance strategies, by comparing sites where the Original Equipment Manufacturer (OEM) performs all the Operations and Maintenance (O&M) (a Full OEM scheme) against sites where either the owner or another sub-contractor performs all the O&M (a No OEM scheme). No OEM arrangements have had a higher PBA than Full OEM arrangements for the last two years. However, No OEM farms tend to keep a higher number of vessels chartered and sustain more transfers throughout most of the year implying more O&M activity is taking place to help achieve the higher PBA.

It is widely acknowledged that benchmarking is a vital tool in allowing an industry to grow and mature. Without benchmarking the industry has nothing to compare against and ill-informed decisions may be made. Tools such as SPARTA allow the offshore wind industry to better develop and aid the reduction of global emissions and further reduce the levelised cost of energy for offshore wind.

All owner/operators with wind farms in UK waters are partaking in the 2018/19 portfolio review and owner/operators of offshore wind farms in mainland Europe are encouraged to join the platform. With more wind farms, better benchmarking can be undertaken for the benefit of the whole industry.





2. Introduction

2.1 Why Read This Report?

This third SPARTA Portfolio Review details key trends identified over the last reporting period, and longer-term trends. These reviews identify the key drivers of offshore wind farm performance and give insights into how they could potentially improve.

2.2 What is SPARTA?

SPARTA is an offshore wind farm performance benchmarking tool, run by industry for industry. Standing for 'System Performance, Availability and Reliability Trend Analysis', this tool allows owner/operators of offshore wind farms to compare key performance indicators (KPIs) for their farms to aggregated and anonymised benchmarks. The SPARTA Joint Industry Project (JIP) is sponsored by The Crown Estate and the Offshore Renewable Energy (ORE) Catapult.

This data sharing platform was created to allow owner/operators to securely share and validate their KPIs, for true benchmarking. Participants can access benchmarks via the online tool and through monthly issued executive dashboards.

Offshore wind performance benchmarks are available from January 2014. In total, owner/operators can supply a maximum of 159 KPIs and then have access to over 500 benchmarks every month, including derived values, covering four main areas:

- Availability
- Production and Lost Production
- Reliability
- Operations

2.3 Who is Involved?

All owner/operators with offshore wind farms in UK waters are participating in the 2018/19 SPARTA Portfolio Review. An overview of the SPARTA population is given on page 7.
A key goal of SPARTA is to secure participation from offshore wind farms from around the world, strengthening the benchmarking process.

2.4 Principles of SPARTA

The SPARTA platform has been designed based on the following principles, which have helped establish SPARTA as the industry-leading performance benchmark provider for offshore wind:

- **Anonymity:** Generation of benchmarks requires sensitive operational data. All owner/operators want to know how other wind farms are performing, but they do not want to reveal their own KPIs. SPARTA has solved this by aggregating the metrics that are securely uploaded into an anonymised data pool. Maintaining anonymity has created a pathway for data sharing and industry benchmarking between the owner/operators of wind farms.
- **Transparency:** There is complete transparency in definitions and methodologies used and these are published in a Metric Handbook. Consequently, results are clear, comprehensive and consistent.
- **Quality:** Extremely high quality and reliable output is achieved through continuous metric assurance and verification activity.
- **Representative data volume:** SPARTA benchmarks are based on a representative population, with over 60% of all installed capacity of offshore wind farms in UK waters providing performance data on a monthly basis for over four years.
- **Industry-Led:** The SPARTA system was designed by owner/operators for owner/operators and is continuously improved to ensure it reflects industry needs. The associated JIP has representation from all UK offshore wind farm owner/operators at both steering group and technical advisory group level. The steering group is co-chaired by Mona Riis, Production Manager at Equinor and Adrian Fox, Head of Energy Assets at The Crown Estate.
- **Monthly Benchmarks:** New benchmarks are made available to members every month. This reveals seasonal variations and can inform detailed optimisation of operations and modelling of new wind farms.

2.5 Access to Graph Data

The anonymised data that built the graphs shown in this report is available through the ORE Catapult Platform for Operational Data (POD), allowing further investigation into the insights provided.

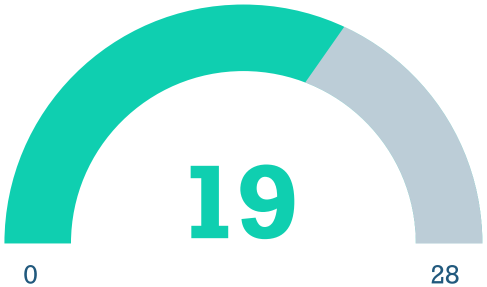
3. SPARTA 2018/19

3.1 SPARTA Wind Farm Population

The 2018/19 Portfolio Review includes all major owner/operators for offshore UK wind farms and is currently reporting on 60% of the installed capacity within the UK.

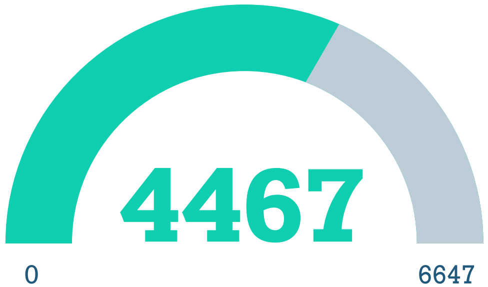
Number of Owner Operators

Number of Wind Farms



Number of Turbines

Installed Capacity (MW)



3.2 Key numbers

For this portfolio review the period April 2018 to March 2019 (inclusive) was studied. Some interesting figures for this reporting period include:

95.16%	Average production based availability
36.05%	Average capacity factor
7,020	Total number of crew transfer vessel days
60,792	Total number of transfers
13,482,955 MWh	Total generation
4,135,896 Tonnes	CO_2 offset
4.35M	UK homes powered

4. Age of SPARTA Portfolio

As SPARTA ages, so does the reporting fleet, see Figure 1. Old farms are increasing the SPARTA Portfolio average age but new large-capacity farms are coming in, reducing the average age. This is leading to the average age plateauing as the rate of new farms coming in matches the aging of the population.

Looking at the age of the wind farms split by their commissioning date (Figure 2), you can see how the oldest farms have reached the middle of their predicted life, with a predicted span at 20-25 years, with the youngest farms still in their first five years of operations, likely still in their initial warranty contract.

Over the life of SPARTA, the reporting population has changed, with a large influx of farms that were commissioned in the 2013 to 2017 period over the first two years of operation of the project (2015-16). Over the last year we have started to see the increase in newer wind farms whilst the addition of older farms has slowed.

Figure 1 - Average Age of Wind Farms in SPARTA

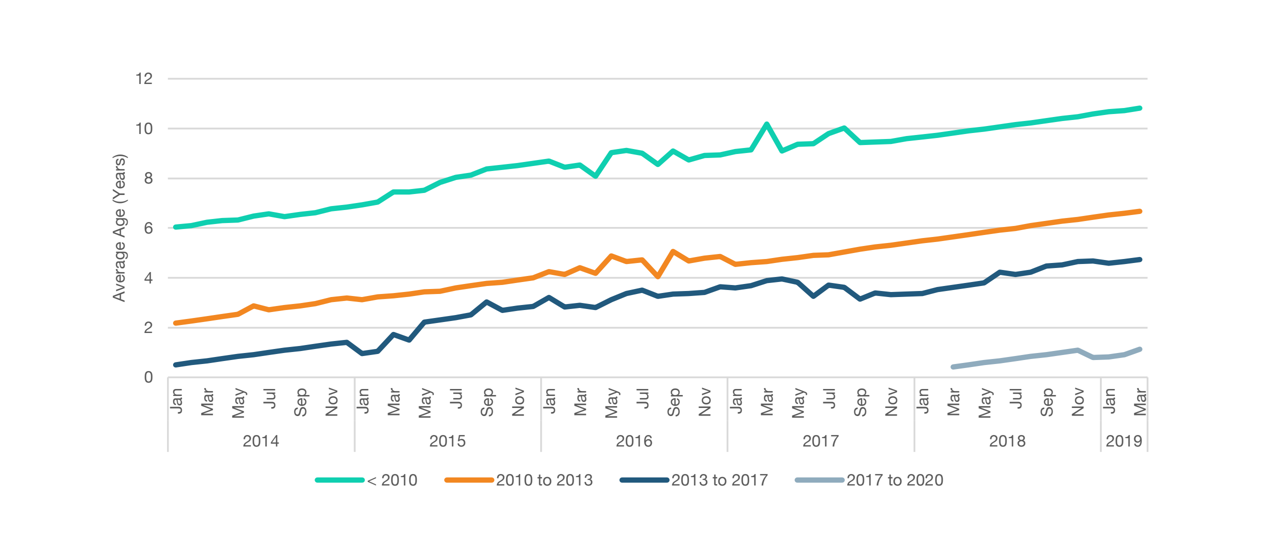


Figure 2 - Average Age of SPARTA Portfolio by Online Date

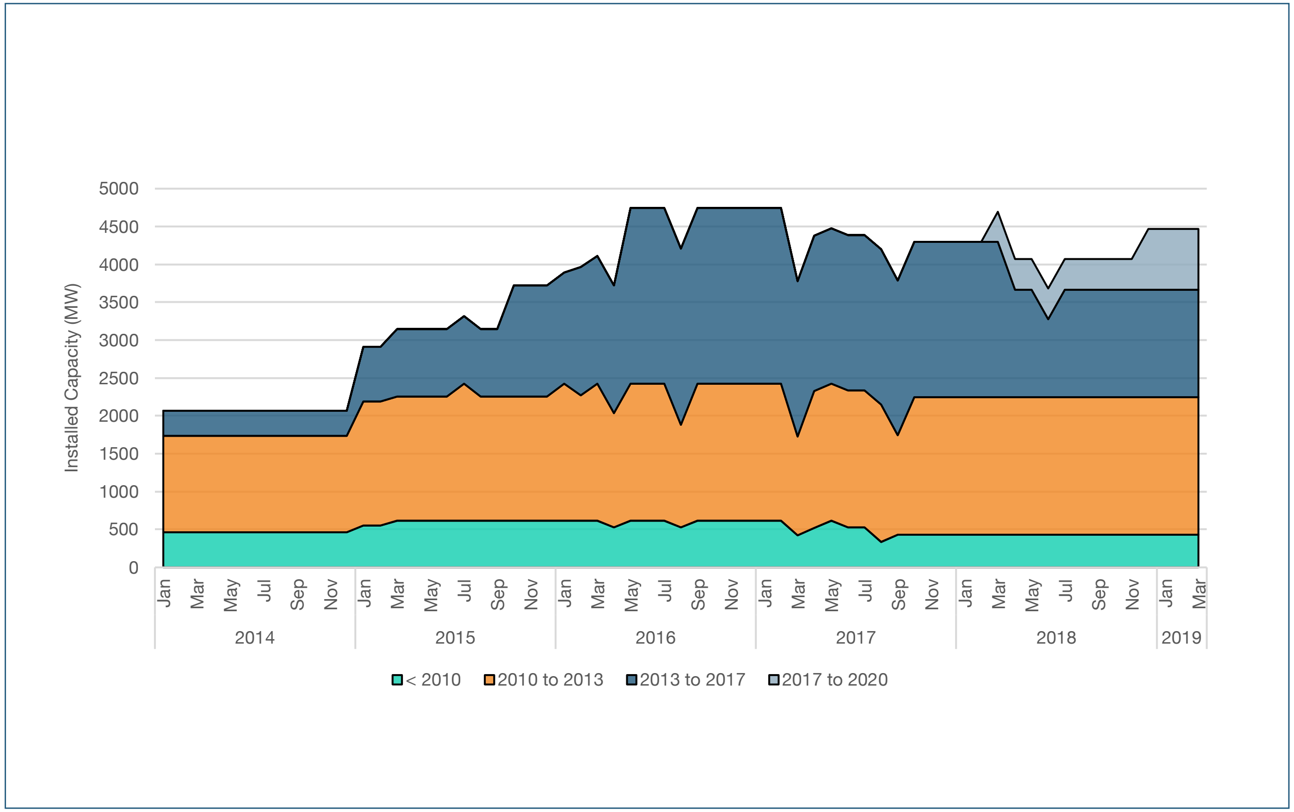


Figure 3 - Installed Capacity in SPARTA Over Time by Online Date

5. SPARTA Trends for 2018/19

5.1 Capacity Factor and Generation

This year, the SPARTA monthly average capacity factor peaked at 53% in November, an extremely high value, with only seven out of 66 reporting months having a higher average value. As expected, this metric is strongly related to the seasons, due to wind speed being the main driver of capacity factor. If owner/operators wish to exploit this seasonal trend, they should intend to do as much maintenance as possible prior to the high wind period, to have their turbines fully operational and able to capture as much wind as possible in the Autumn and Winter periods.

What is Capacity Factor?

Capacity Factor is a measure of how much power a turbine is producing compared to its rated capacity. Generally, this is reported over a period of time for a wind farm, so is a measure of how well the farm is producing on average compared to its rated capacity.

Example
A 500MW wind farm produces 219,000 MWh for a month. For a capacity of 500MW for a month (730 hours), the farm had the potential to produce 365,000MWh.

219,000MWh / 365,000 MWh = 0.6 = 60%

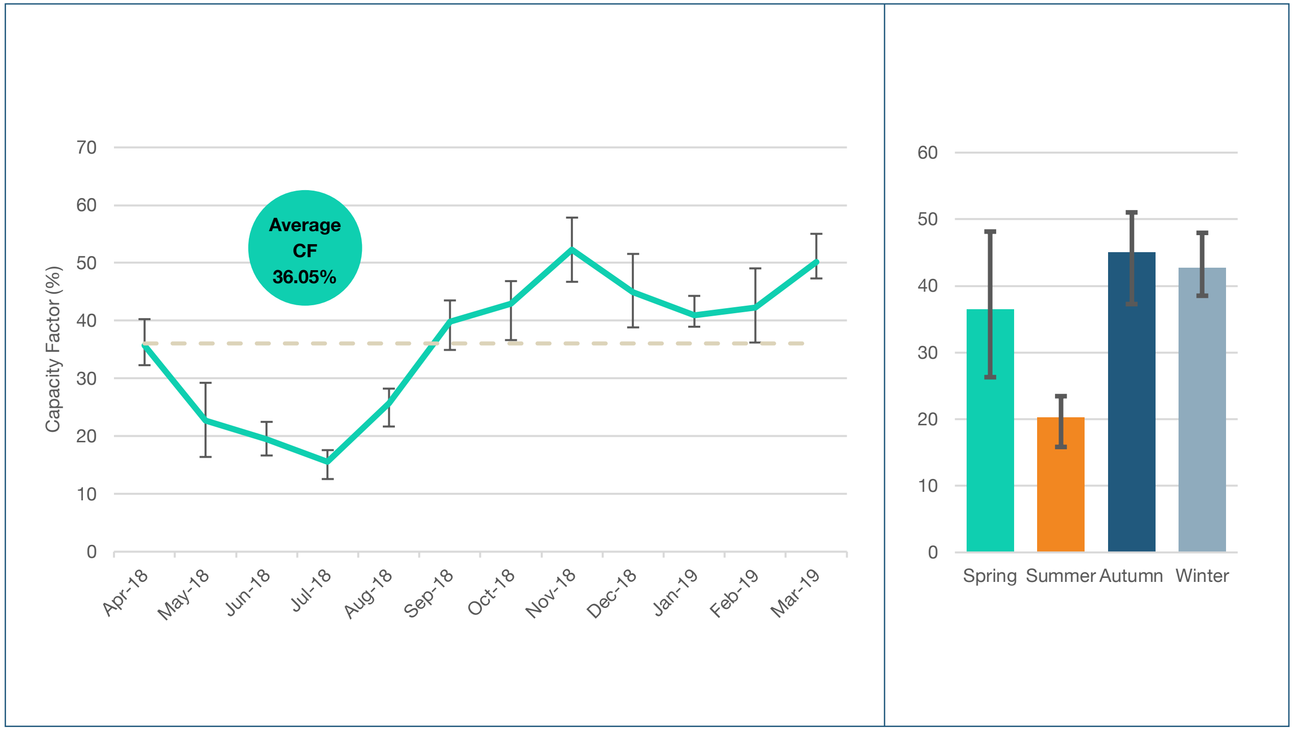
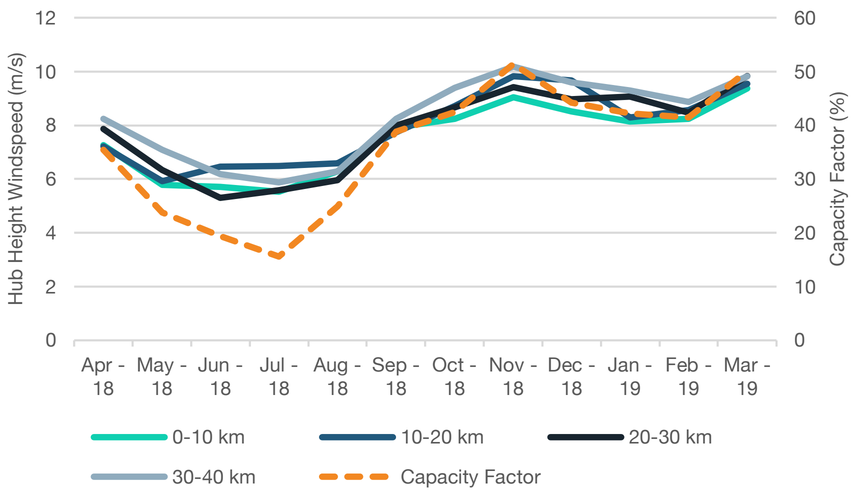


Figure 4 - Average Capacity Factor Over Year, Right Showing Seasonal Averages (error bars represent P25 & P75)



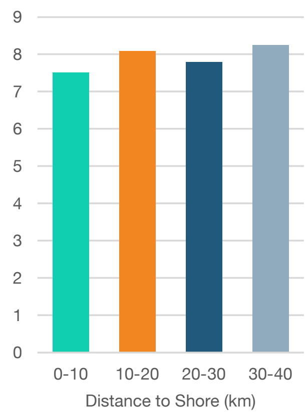


Figure 5 - Mean Hub Height Windspeed by Distance to Shore, Capacity Factor Also Shown

5.1.1 Windspeed by Distance to Shore Comparison

The significant impact that wind speed has on capacity factor is clear when you compare the trend in the capacity factor to the trend in the wind speed, as shown in Figure 5. The graph shows the trend in windspeed over the year, broken down by distance to shore. Here the data shows how windspeed is driven by distance to shore, with farms further from shore obtaining higher windspeeds.

5.1.2 Capacity Factor Probability

An alternative way of looking at the capacity factor is to look at a probability density function (PDF) for all capacity factor values entered (i.e. starting from 2014 and not just this period).

Looking at a PDF of the capacity factor gives an indication of where most values lie. For each segment the percentage tells you the number of submitted values that lie in that range. For example, a wind farm has a 0.5% chance of having a capacity factor between 0% and 5% and a 14.75% chance of have a capacity factor between 30% and 35%.

Indeed, if a normal distribution is plotted over the obtained values it can be noted that the submitted values are very similar to what would have been predicted. This can be seen in Figure 6 and is obtained using the mean capacity factor of 37.45% and a standard deviation of 14.02%. However, the capacity factor values don't meet this normal distribution by being skewed to the right. This is likely caused by the local wind distribution being acted on by the right skewed shape of a wind turbine power curve.

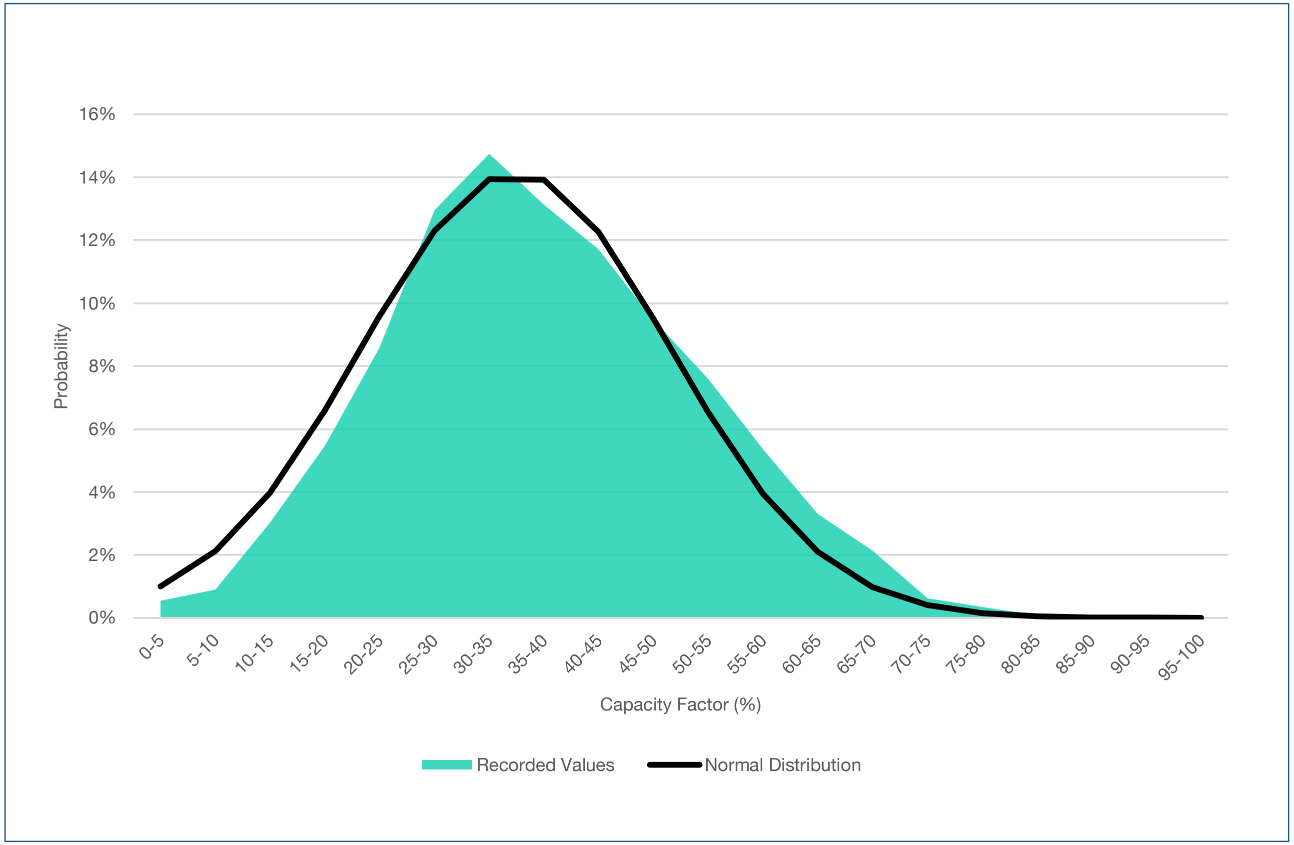


Figure 6 - Capacity Factor Probability Density Function with Normal Distribution Shown

5.2 Production Based Availability

Continuing from last year's portfolio review, the Production Based Availability (PBA) for the portfolio is exceptionally high, with an average value of 95.16% with values never dropping below 70%.

Figure 7 shows how the PBA varies throughout the year. As it can be seen there is little seasonality in the numbers, with the only exception being July-2018 where several farms suffered low PBA values.

What is Production Based Availability?

Production Based Availability, or PBA, is a measure of how well the turbine is using the wind resource available to it. Unlike the capacity factor, PBA does not punish for low winds, as it measures how well the turbine is performing compared to its power curve, given the wind speeds that occur at that site.

Example
The wind at site is 6m/s and the power curve 'says' the turbine should be generating 1000kW but the turbine is only producing 700kW. This would give the turbine a PBA of 700kW/1000kW, so 70%.

700kW/1000kW = 70%

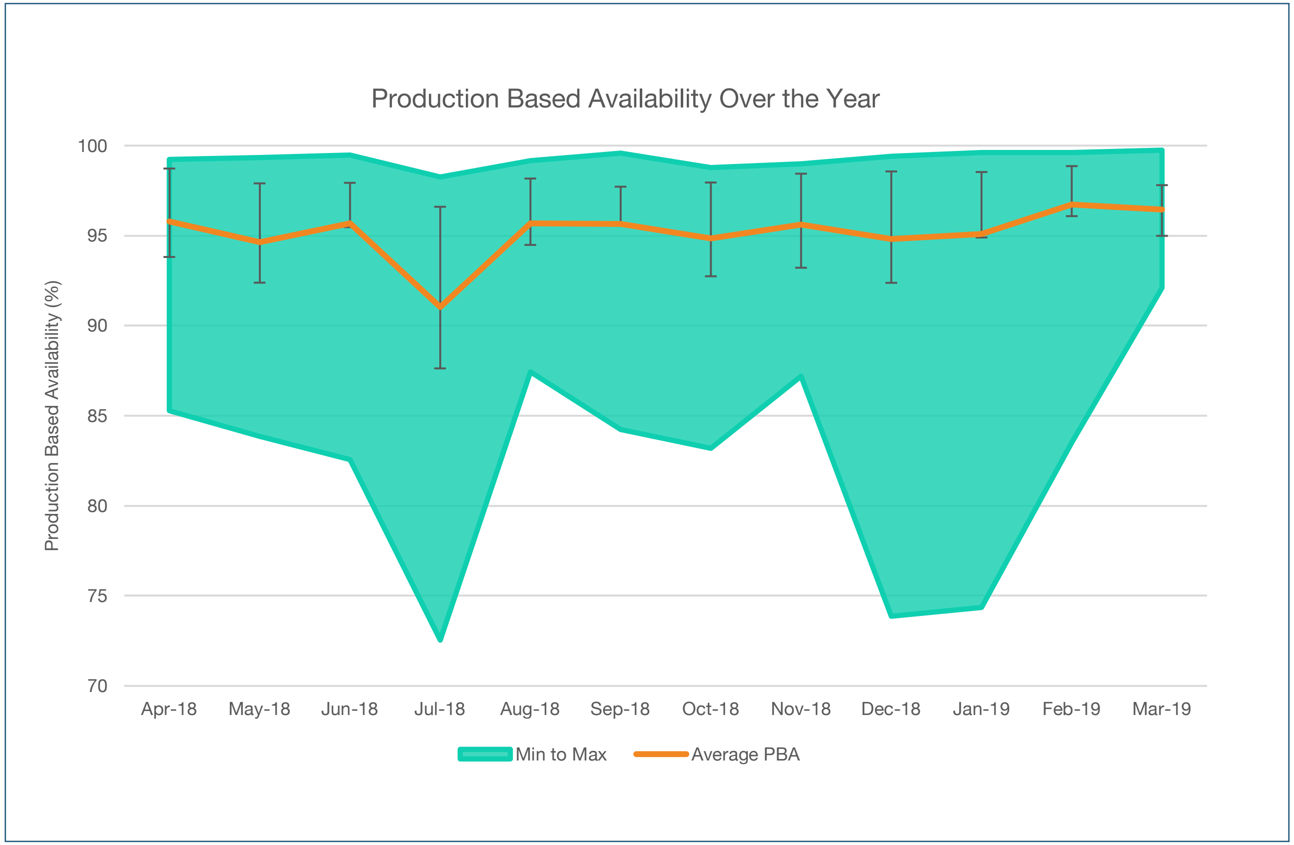


Figure 7 - Production Based Availability Over the Year (error bars represent P25 & P75)

5.3 Technician Transfers

5.3.1 Transfers Over Time

One of the interesting discussions that came out of last year's portfolio review was the potential safety insights that could be inferred from this data. An interesting observation made last year was that the number of transfers is reducing year on year. It can be clearly seen that this trend continues in 2018/19 with the lowest average value yet, with a year's average of 6.81 transfers per turbine per month. This can be directly correlated to improving safety as less transfers means less chance of injury or harm.

5.3.2 Transfers by Environment

Number of transfers per turbine is linked to safety in another manner, the weather conditions in which these transfers occur. While SPARTA cannot give weather conditions at specific transfers it can use the monthly averages to determine the likely conditions at site during these transfers.

As shown in Figure 9, the number of transfers peak when the average significant wave height is at its lowest and falls to its low point when the average significant wave height is at its highest. The area of interest is where the two lines cross; wave heights are increasing but the number of transfers has not yet fallen completely. For example, in September 2018 there was an average of 8.1 transfers per turbine while the average significant wave height was still 0.93m.

In order to increase safety, operators should be aiming to do the majority of their maintenance whilst the environmental conditions are at their calmest, namely May, June and July this year.

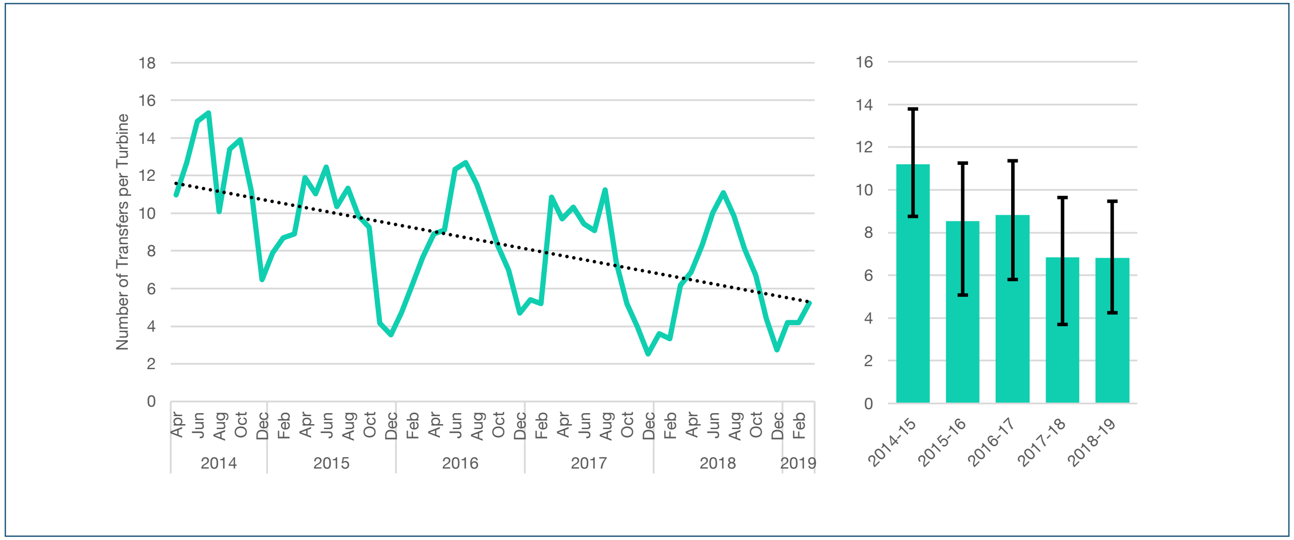


Figure 8 - Number of Transfers per Turbine Over Time (error bars represent P25 & P75)

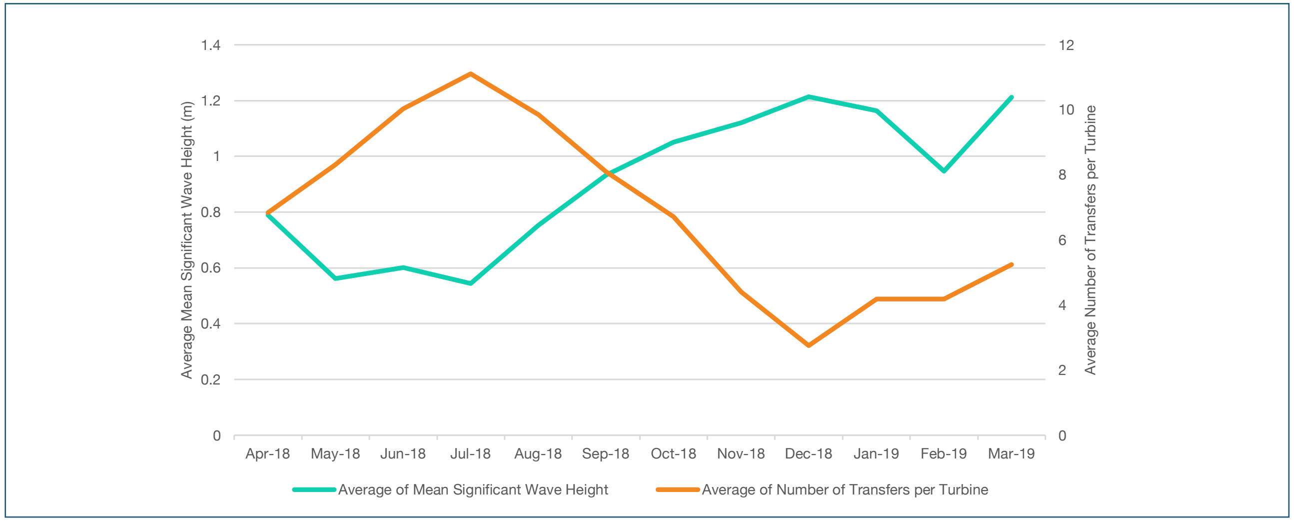


Figure 9 - Average Number of Transfers per Turbine with Average Significant Wave Height

6. Deep Dives

6.1 Coastal Comparison

The offshore wind industry in the UK is growing rapidly with significant expansion off both the East and West coast of England. When planning a wind farm, geographical placement is a key decision to make early on, as site conditions can affect access and production. This investigation covers the differences in performance and maintenance patterns between wind farms on the East and West coast of the UK.

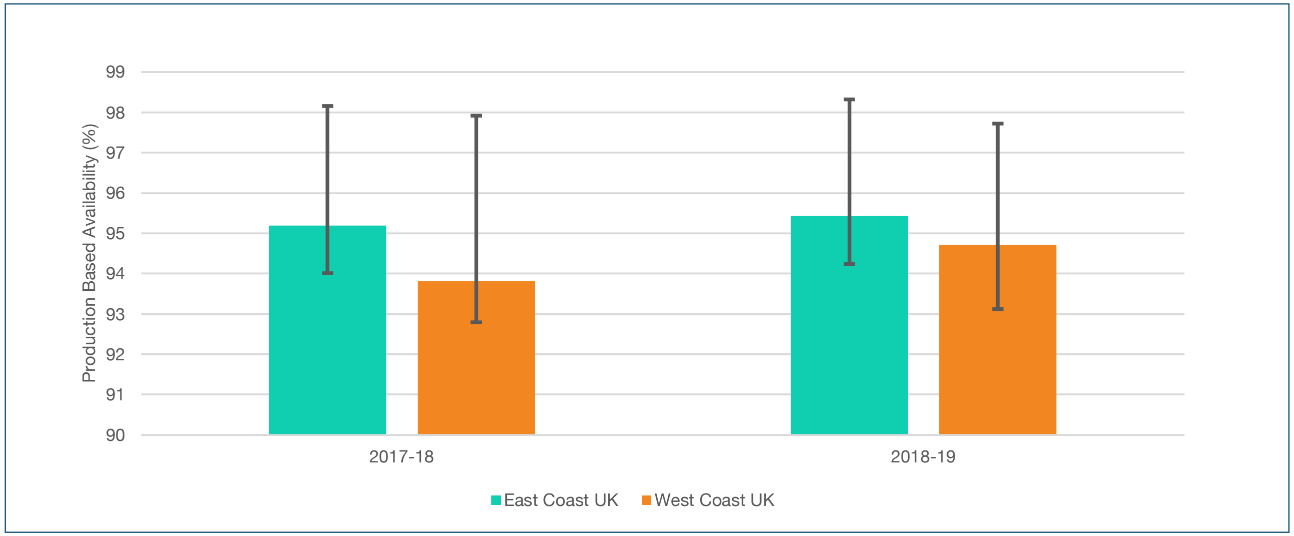


Figure 10 - Average Production Based Availability by Financial Year (error bars represent P25 & P75)

6.1.1 PBA and Capacity Factor

The key comparison that prompted this investigation is the difference between PBA and capacity factor between East and West coast. Over the past two reporting periods, the East coast wind farms have had higher PBA values than West coast wind farms (see Figure 10) yet have failed to meet the capacity factor values the West coast achieves.

Figure 11 shows how the West coast wind farms have a higher capacity factor compared to the East coast, with the exception of the period 2015 to 2016. Due to the PBA metric only being verified during the latter half of 2016, data on capacity factors dates back further than PBA, hence more reporting periods are shown.

This difference between capacity factor and PBA is intriguing. If West coast farms could increase their PBA value to that of East coast farms, they could have the potential for producing a lot more power due to their higher capacity factor.

While the West coast had a larger lost energy production per MW during 2017-18, which corresponds to a low PBA, the difference in lost energy production per MW during the current period was negligible, yet there was a significant difference in PBA.

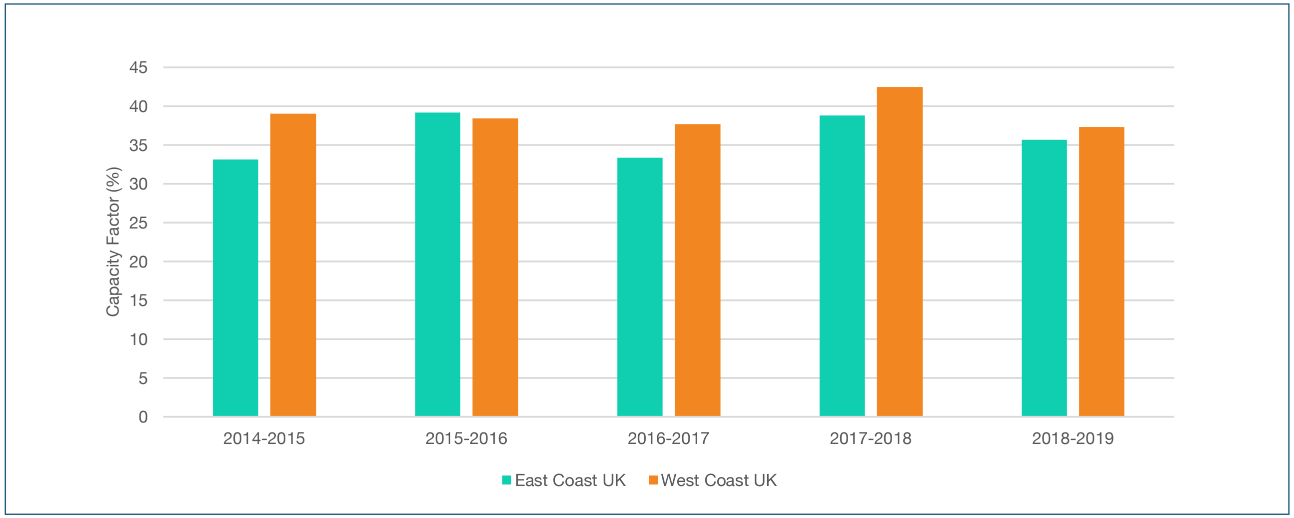


Figure 11 - Average Capacity Factor by Financial Year and Region

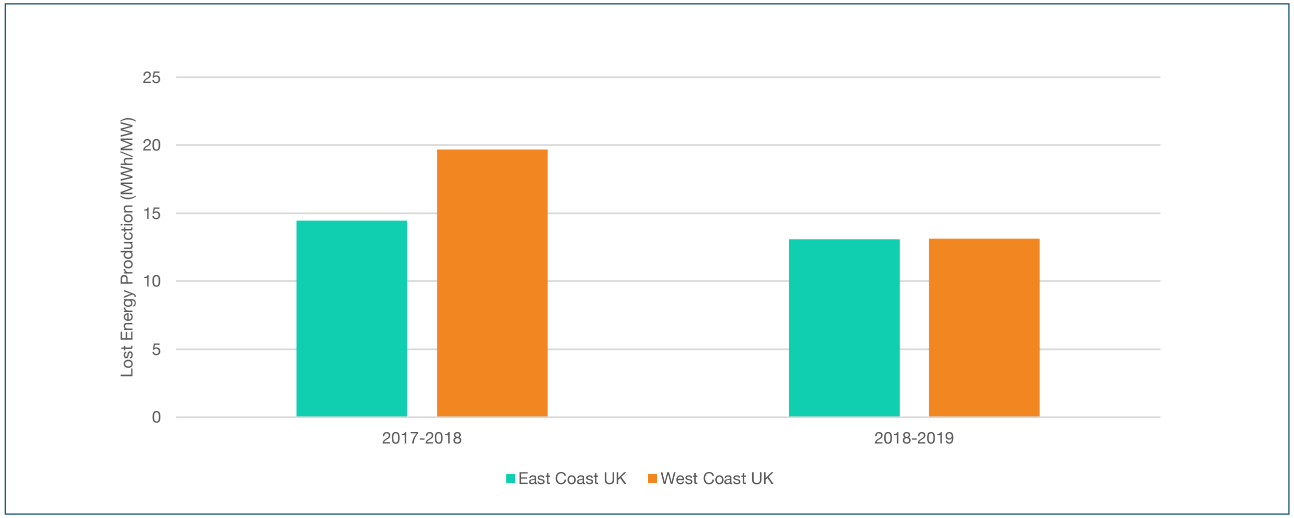


Figure 12 - Average Lost Energy Production per MW by Year and Region

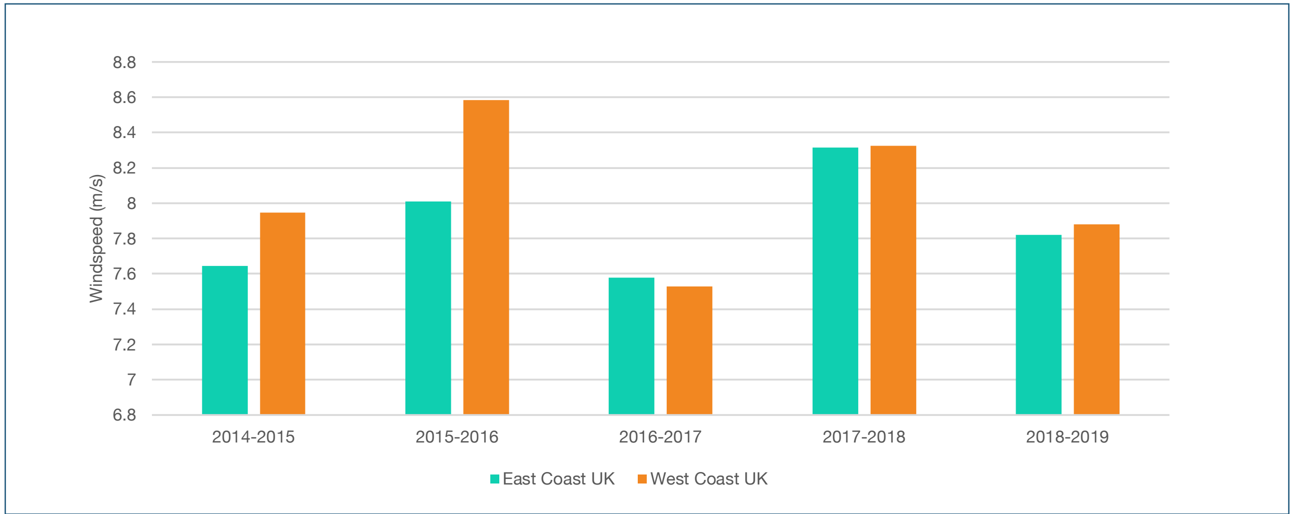


Figure 13 - Average Hub Height Windspeed by Year and Region

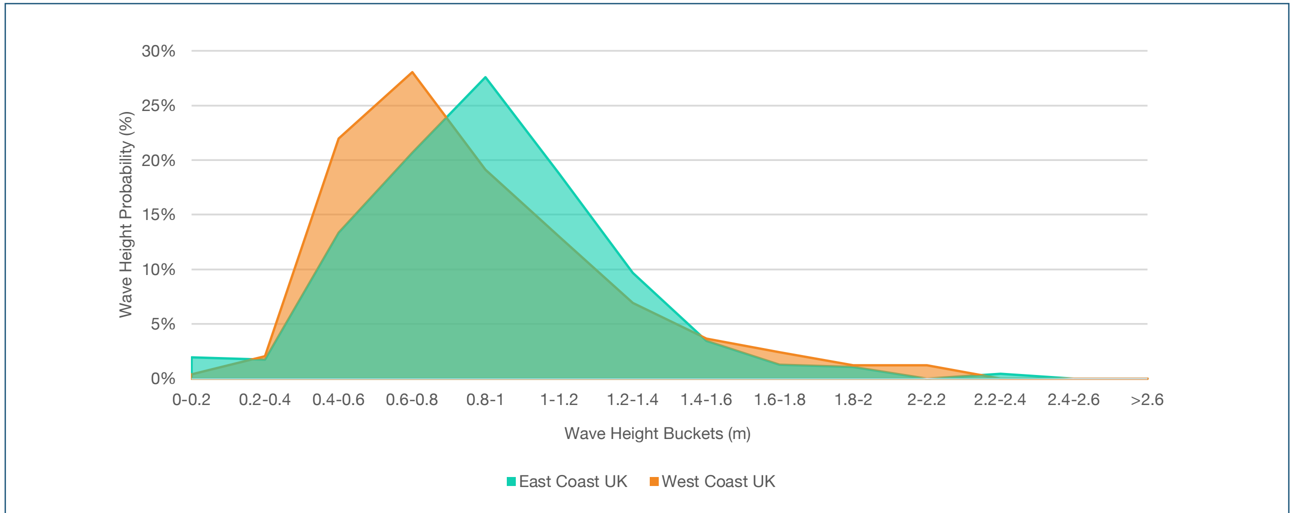


Figure 14 - Significant Wave Height Probability Density Function by Region

6.1.2 Uncontrollable Variables

Mean Hub Height Wind Speed

Traditionally it is assumed that the West coast of the UK has higher average wind speeds as the prevailing wind over the UK is westerly and East coast wind farms must contend with more land shielding them. The SPARTA data provides evidence to back up this claim, however, the difference is not significant. The difference in average hub height wind speeds between the East and West is shown in Figure 13, with the West having slightly higher winds, around 0.16m/s higher on average. For all years apart from 2015-16, the difference is within 4%.

Mean Significant Wave Height

A higher mean significant wave height poses more risk to crew transfer vessels and maintenance workers; as reported in last year's portfolio review, higher wave heights leads to more non-access days. The information below is displayed as a probability density function and shows that West coast wind farms have a lower chance of medium-to-high wave heights but both the East and West have similar, but low, chances of high wave heights. The below graph uses all SPARTA data averaged and not just the most recent period.

Number of Non-Access Days

This combination of environmental factors can mean that wind turbines are sometimes inaccessible. Non-access days represent the total amount of time that the wind turbines are inaccessible due to weather conditions in each month. More non-access days can indicate delayed maintenance which leads to lost production. Despite, as previously seen, the slightly calmer waters and the only small difference in wind speed on the West Coast compared to the East, West coast wind farms year on year experience more non-access days due to weather.

Water Depth and Distance to Shore

Most operational wind farms in the UK to date are installed in relatively shallow waters. Deeper waters can lead to increased wave heights and are generally found further from shore.

Figure 16 shows how wind farms on the West coast are, on average, installed in waters 3m deeper than wind farms on the East coast but are found in waters closer to shore, as shown from 4cOffshore data [3].

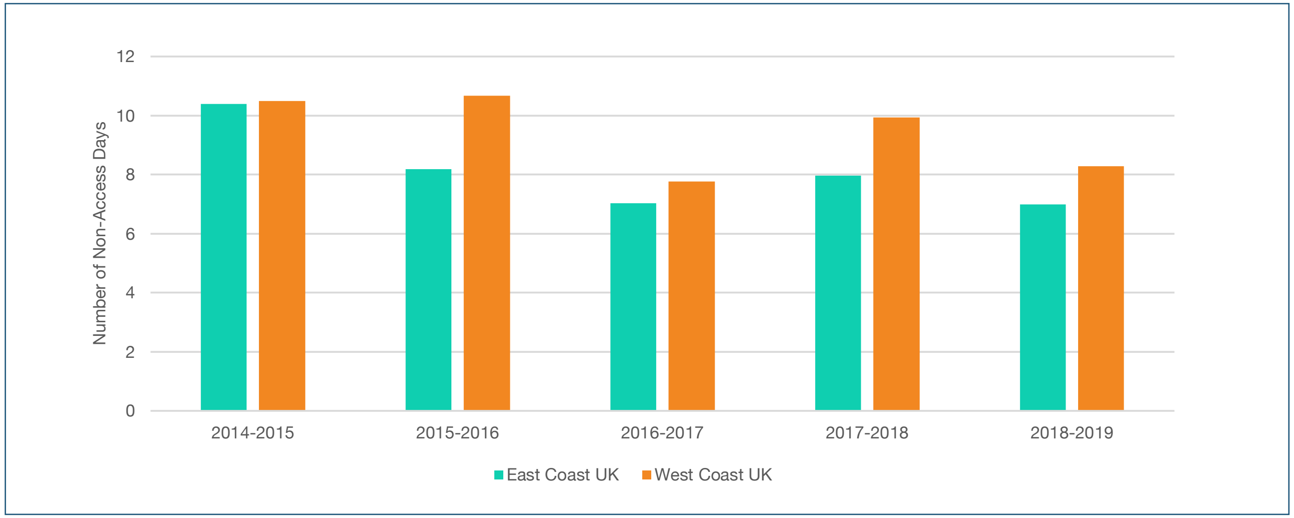


Figure 15 - Average Number of Non-Access Days by Year and Region

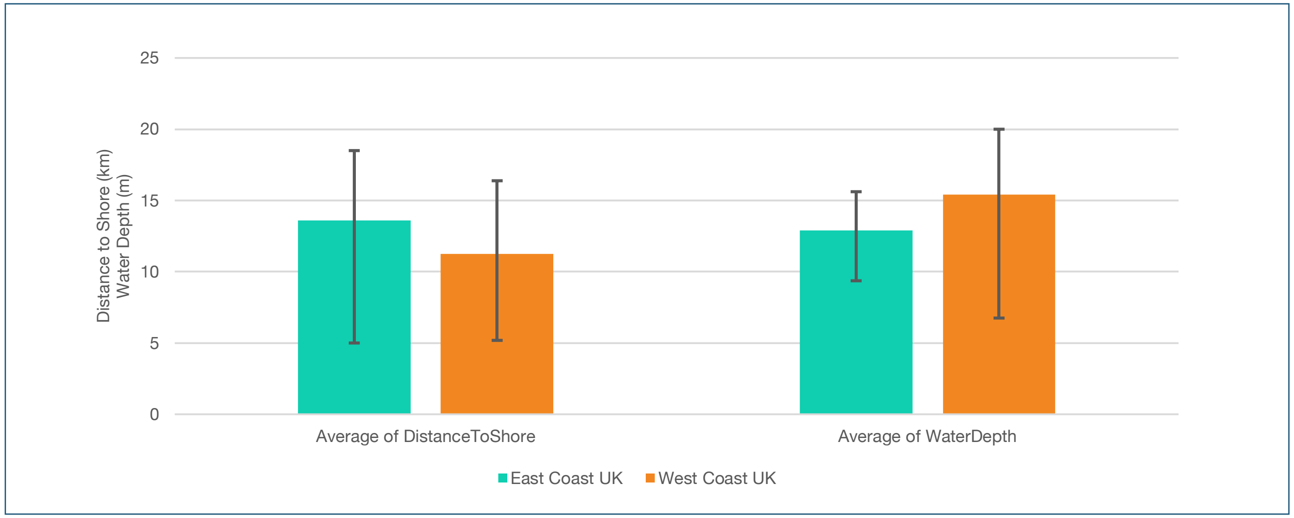
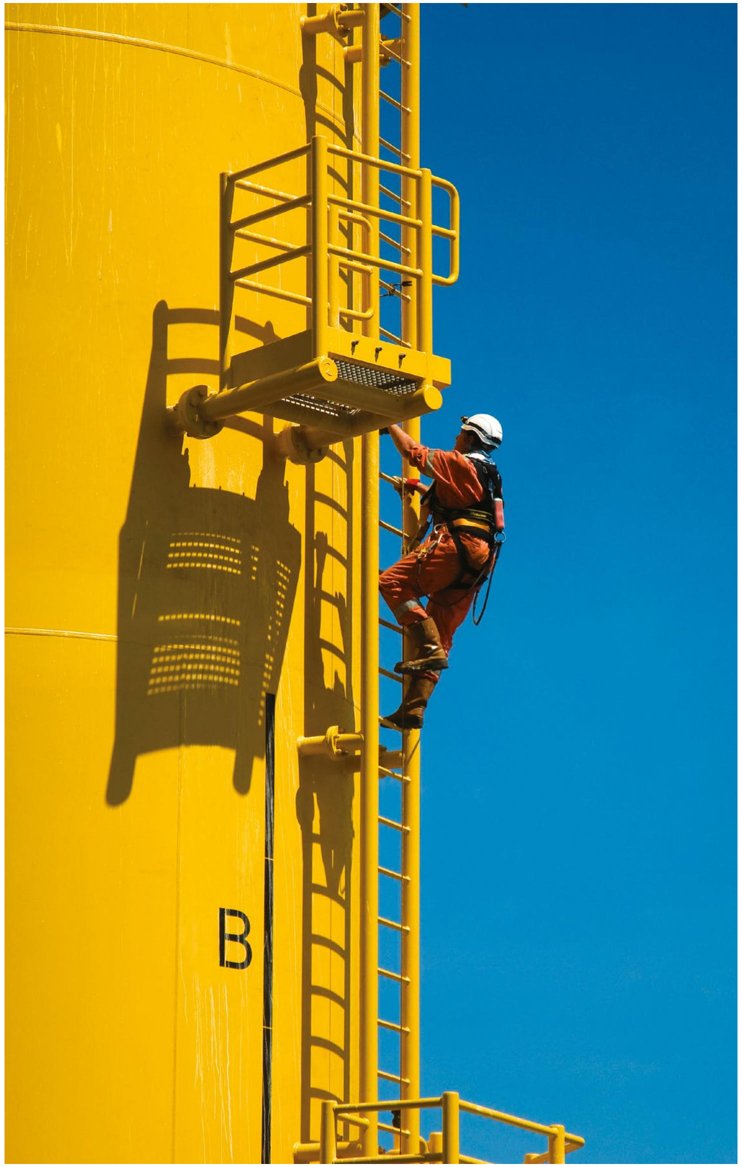


Figure 16 - Average Distance to Shore and Average Water Depth by Region (error bars represent P25 & P75)



6.1.3 Controllable Variables

Transfers per turbine

Figure 17 shows how the number of transfers per turbine varies over the year, using all SPARTA data averaged. This figure clearly shows how West coast wind farms are consistently performing more transfers per turbine. More transfers indicates that more work is being undertaken at the farm, which can potentially lead to better performance from the wind turbines but this will have safety implications.

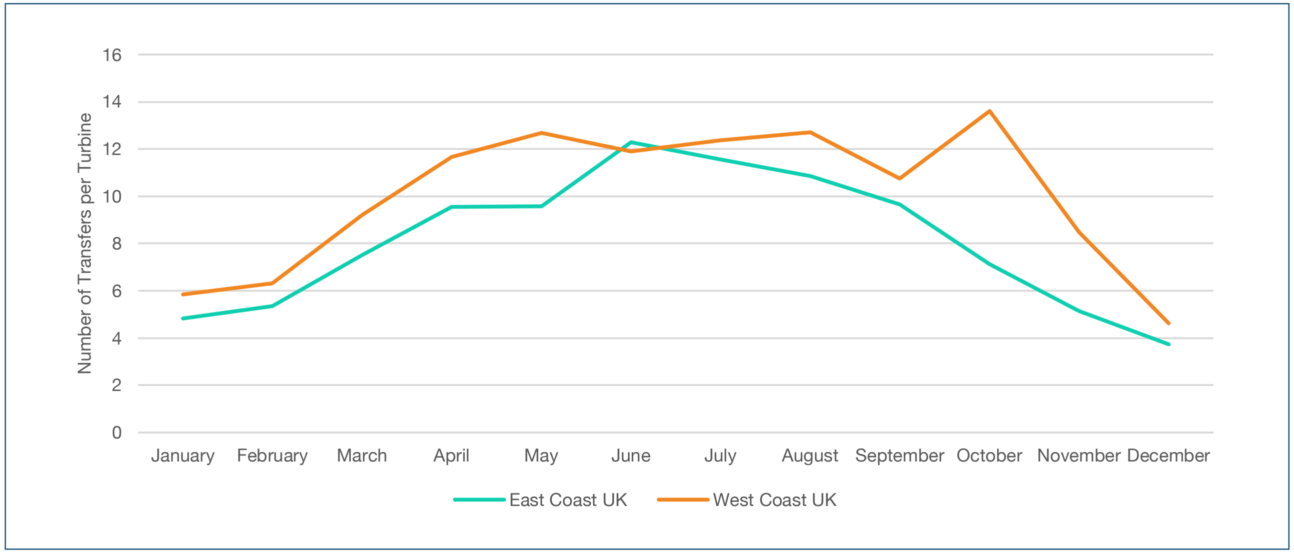


Figure 17 - Average Number of Transfers per Turbine by Region

6.1.4 Summary of Observations

There is no one deciding factor that leads to the disparity between the capacity factor and PBA on the West coast. The above table was created to highlight the different observations made in this deep dive.

It is important to note that there are 11 reporting wind farms on the East coast and only six reporting wind farms on the West coast for the 2018-2019 period. Although there does not seem to be any "rogue" wind farms (where one farm performs significantly differently to the others), if a wind farm was to provide an outlier number it will have more of an effect on the West coast averages than it would on the East.

There are many other variables that can affect power production from wind farms that are not captured in the SPARTA database, for example activity on the power grid. Unexpected lost production due to maintenance on the power system occurs over the years but is not captured in SPARTA data.

This dive into performance by geographical region has uncovered many interesting observations about the West coast and East coast. Although it was not possible to pinpoint an exact reason for this difference in performance, many possible factors were identified. In reality, it is likely to be a combination of all of these factors, and more.

	East Coast	West Coast
Wave Height	Higher	Lower
Wind Speed	Lower	Higher
Number of Transfers	Lower	Higher
PBA	Higher	Lower
Capacity Factor	Lower	Higher
Lost Energy Production	Lower	Higher

Table 1 - Summary of Observations Over All Time from Regional Analysis

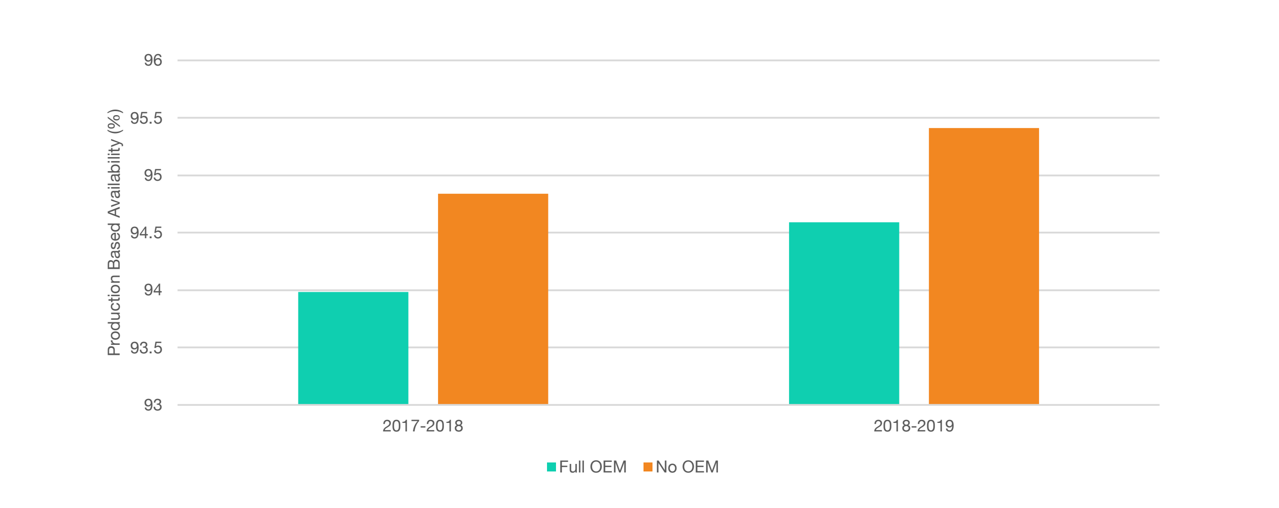


Figure 18 - Production Based Availability by Year and Maintenance Provider

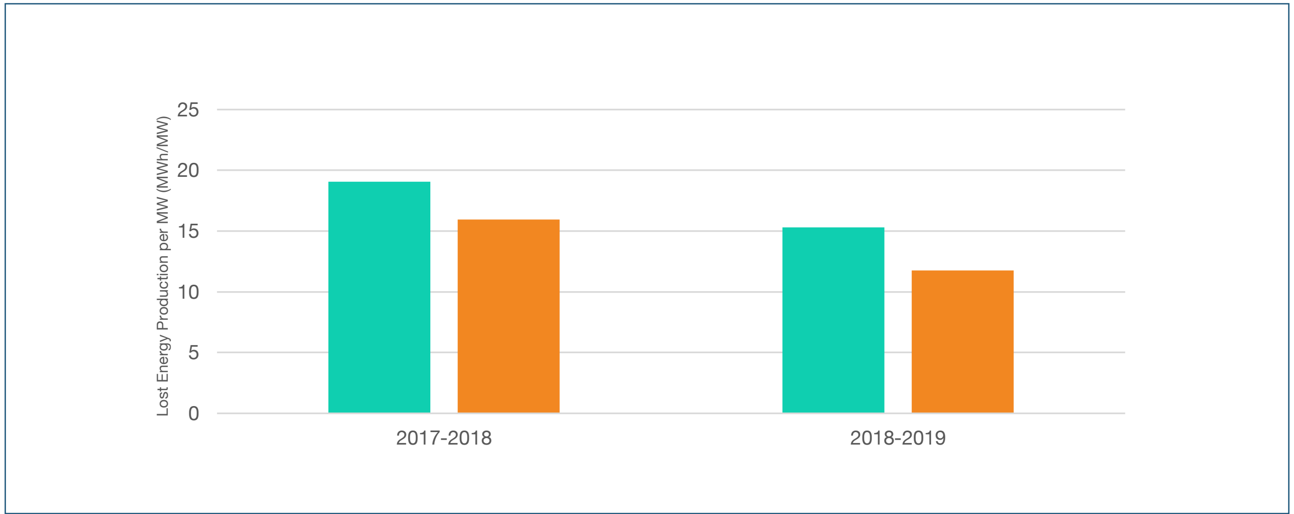


Figure 19 - Lost Energy Production per MW by Maintenance Provider

6.2 Maintenance Providers

Turbine Original Equipment Manufacturers (OEMs) provide maintenance contracts in the form of equipment warranties to support a newly commissioned wind farm in its early years, normally for the first five years. Once the initial warranty comes to an end some owner/operators extend these contracts for large periods of wind farm lifetime, whilst some wind farms take an in-house approach. Some wind farms adopt a hybrid approach to O&M, where the OEM will take responsibility for some elements such as any jack-up activity and the owner/operator, or some other independent service provider, carries out all other service and maintenance. Comparing the Full OEM arrangement with the No OEM arrangement will provide interesting insights into different maintenance approaches to optimising the operation and maintenance (O&M) of an offshore wind farm.

6.2.1 Production Based Availability

Looking at the PBA, with only two years of data to assess, no long-term trends can be identified, however, the main finding is that No OEM arrangements have a higher PBA than Full OEM arrangements for both reportable periods.

This difference in PBA can also be seen in lost energy production, with No OEM arrangements having less lost energy production per MW than Full OEM arrangements.

6.2.2 Seasonal Patterns

As shown in section 5.1, the energy production of a wind farm is governed by the weather and therefore seasonal changes are a large consideration in operating a wind farm.

Figure 20 was created by averaging all data over the different months and shows how over an average year, No OEM arrangements have a higher PBA during most months compared to Full OEM arrangements. The data also shows how Full OEM arrangements have a dip in their PBA values over the summer period, whereas No OEM arrangements have a more stable PBA.

Whilst No OEM wind farms have a higher PBA value, they also have a lower capacity factor, see Figure 21. This indicates that No OEM wind farms are better at capturing the wind resource they have but are exposed to less windy environments. On the contrary it seems Full OEM windfarms are not capturing the wind resource very well but are exposed to higher wind speeds.

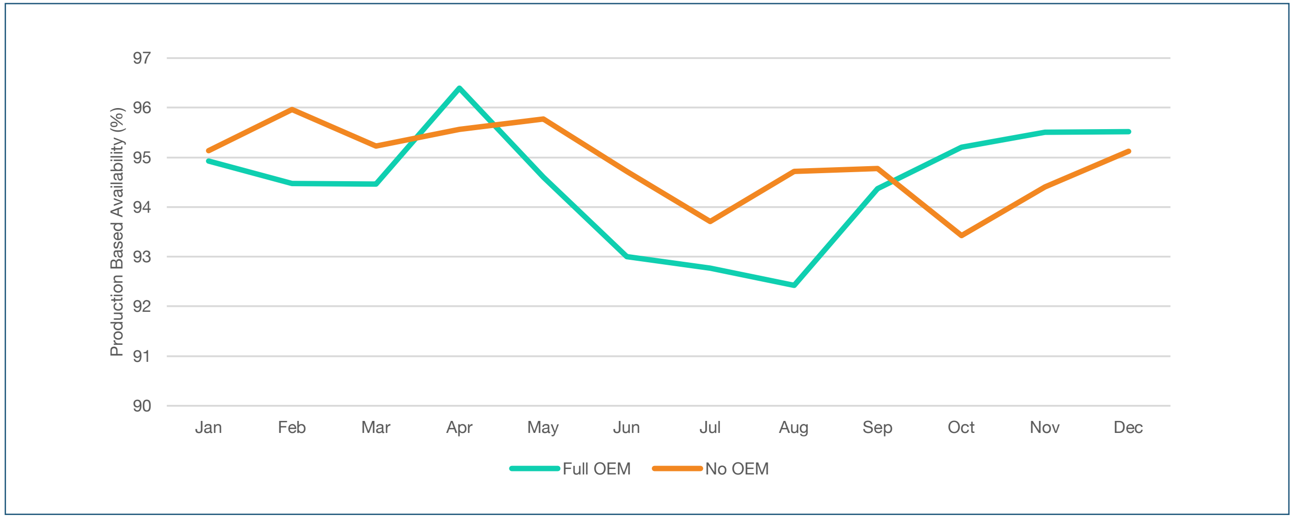


Figure 20 - Production Based Availability Over the Year by Maintenance Provider

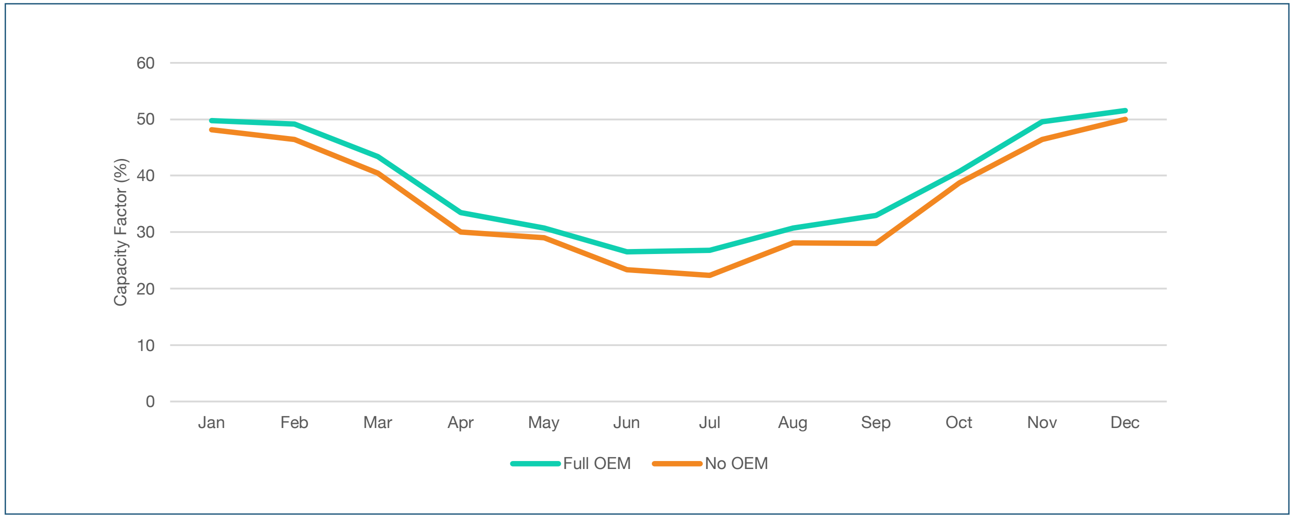


Figure 21 - Capacity Factor Over the Year by Maintenance Provider

Figure 22 shows how Full OEM have a spike in number of transfers per turbine over the summer period, whereas No OEM farms don't seem to have an associated spike, although the associated value does steadily increase throughout the year to a highpoint in September. The patterns seen by Full OEM farms are indicative of a summer maintenance scheme.

In addition to the number of transfers showing this trend, the number of vessel days (shown in Figure 23) shows how Full OEM farms charter more vessels over the summer period, in anticipation of undertaking more work. No OEM farms tend to keep a higher number of vessels chartered, with a much higher value over the winter period.

The previous two charts reveal significant differences in maintenance strategy. Full OEM farms seem to undertake more maintenance over the summer period and No OEM farms are carrying out less maintenance in the summer period but more maintenance throughout the year. The dedicated effort in summer for Full OEM wind farms does not translate to a reward of better PBA for all winter months where the wind speeds are best.

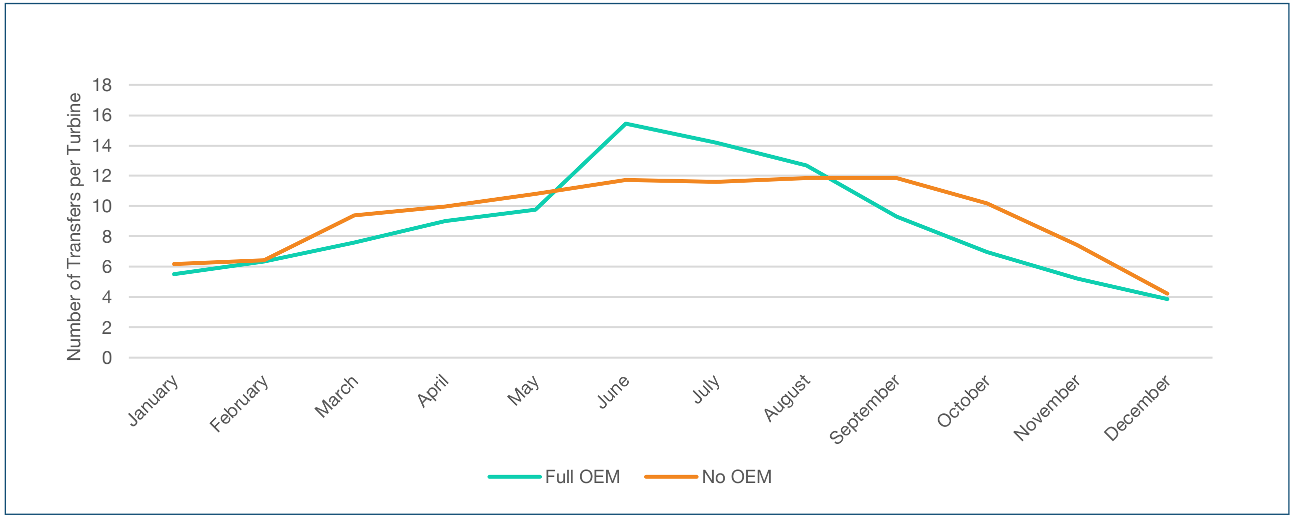


Figure 22 - Average Number of Transfers per Turbine Over the Year by Maintenance Provider

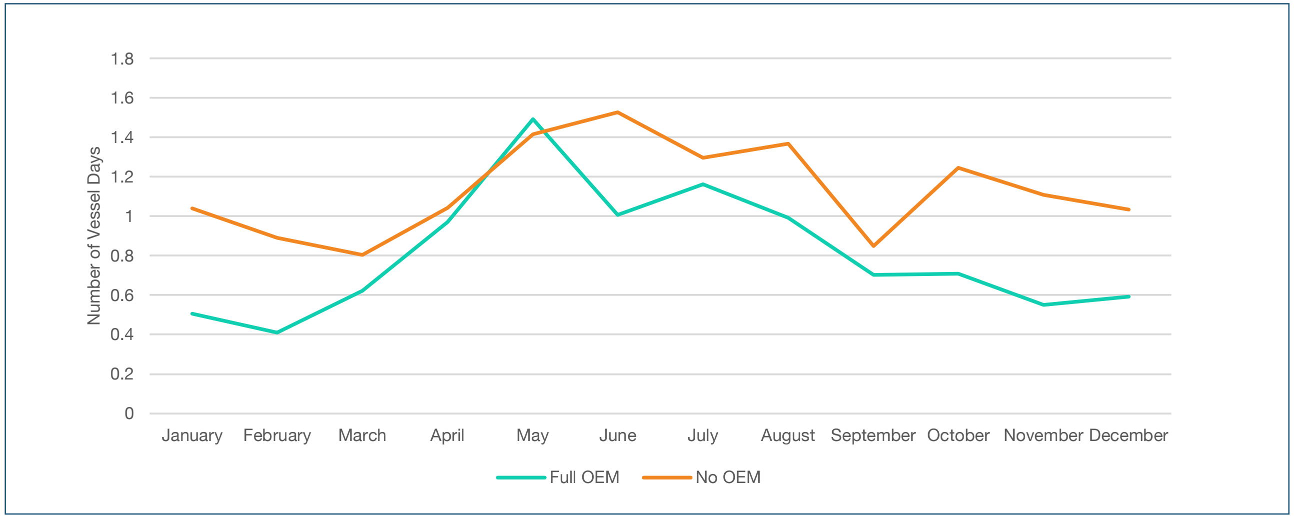


Figure 23 - Average Number of Vessel Days Over the Year by Maintenance Provider

6.2.3 Longer term trends

A look at the longer-term trends helps further understand the difference in operation between No OEM arrangements and Full OEM arrangements.

As stated in section 5.3.1, the number of transfers per turbine is consistently falling. While this number is falling quite rapidly for Full OEM farms, the number has reduced to a smaller extent for No OEM farms, even increasing in the last period.

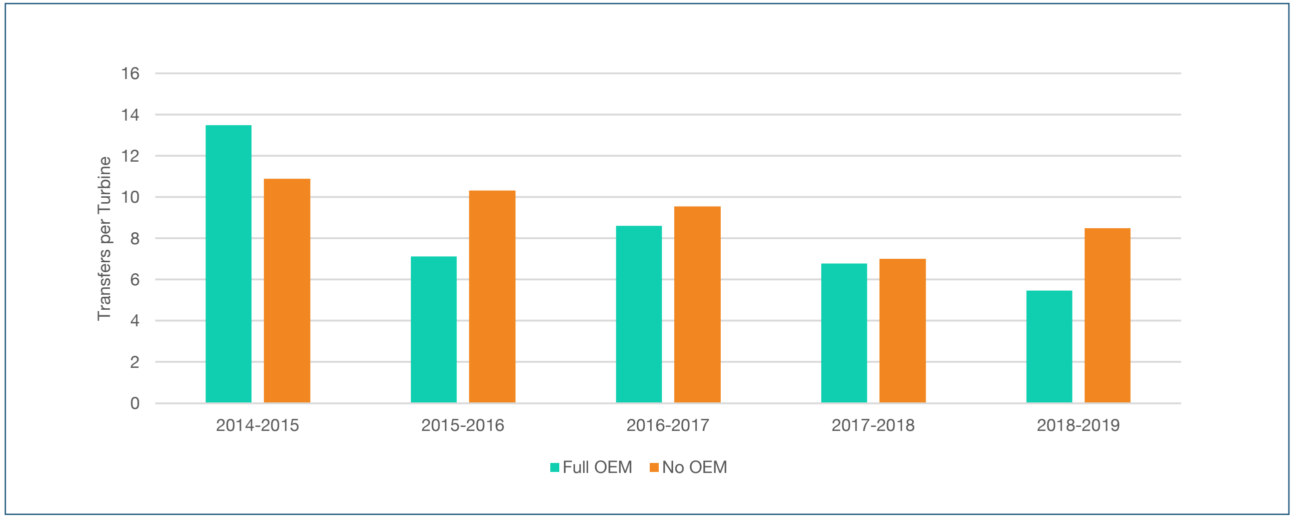


Figure 24 - Average Number of Transfers per Turbine by Year and Maintenance Provider

6.2.4 Summary of observations

Another observation that cannot be made with SPARTA data but is known, is how the different maintenance strategies are staffed. No OEM farms staff work full-time contracts whereas Full OEM farms tend to hire in more seasonal work. This allows No OEM farms to perform maintenance year round and incentivises Full OEM farms to perform bulk maintenance whilst sea conditions are calm.

It's interesting to identify the difference in these maintenance strategies and this learning can be used by operators currently reviewing their contracts. It will be of further interest to monitor how this adapts in years going forward, where in-house O&M knowledge is increasing and the industry continues to mature.

	Full OEM	No OEM
PBA	Less	More
Lost Energy Production	More	Less
Number of Transfers	Less	More

Table 2 - Summary of Observations Over All Time from Maintenance Provider Analysis

Looking ahead

SPARTA was set up to be, and is, the trusted provider of offshore performance benchmarks for the wind industry. As this industry grows, so does the ambitions for SPARTA. Currently SPARTA hosts 60% of the installed capacity within UK waters. With CFD round 2 coming online soon and a UK industry goal of 30GW in the water by 2030, the installed capacity in UK waters is set to grow significantly. SPARTA aims to not only keep its current portfolio percentage but to increase this.

Looking further afield, SPARTA aims to gain a presence within offshore mainland Europe. The UK may be the country with the largest installed capacity to date but other countries such as Denmark, Germany, the Netherlands and Belgium are further increasing their installed capacity. For SPARTA to remain the premium offshore wind benchmarking tool it is imperative that the portfolio continues to expand with the offshore wind industry.

In addition to growing SPARTA's portfolio, the members are continually looking to enhance the tool. Enhancements and upgrades are ongoing to both the system and the KPI definitions. A Steering Group, with full representation of all the industrial members, meet quarterly to set the vision for the system. A Technical Advisory Group (TAG) also meet quarterly to make system and KPI recommendations. The current technical priority for SPARTA is to review and validate the Forced Outage benchmarks – a key measure of turbine reliability. Once validated this will provide downtime, lost production and number of occurrences of different turbine forced outages, giving an insight into turbines failure rates.

SPARTA will always continue to develop for the benefit of offshore wind farm owner/operators. Being an industry run program allows the system to adapt and evolve in parallel with the growth of the offshore wind industry.

Membership

Owner/operators not currently involved in the SPARTA project are invited to join the group through the members collaborative agreement, to add to the anonymised benchmarking data set and benefit quickly from an analysis of their performance against their peers.

Participation in SPARTA also provides owner/operators with the opportunity to work with seasoned professionals in the field of offshore wind farm O&M performance measurement.

Applications or enquiries for new members may be made at any time in writing or by contacting either of the project sponsors:

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